Training report

Online Natural Resources Institute Finland (Luke)-African Dairy Genetic Gains (ADGG) training course on Mix99 genetic genomic analyses software

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Introduction

Currently, the African Dairy Genetic Gain (ADGG) program (https://africadgg.wordpress.com/category/adgg/) operates fully in two countries: Ethiopia and Tanzania, and has commenced preliminary activities in Uganda, Rwanda, Kenya and Nigeria. The aim of this course was to develop and strengthen the capacity of the NARS to effectively undertake and manage their respective national dairy and livestock performance recording and genetic evaluation programs using the MiX99 software with the support of the Natural Resources Institute Finland (Luke), and ADGG.

The ADGG program recently acquired the license for the use of MiX99 software for genetic evaluation purposes, therefore the specific aim of the course was to provide participants with a working knowledge on Linux computing environment and the use of the software MiX99 for genetic and genomic evaluations. A hands-on approach was adopted using a data set of milk yields and body weight, pedigree and genotypes generated from the ADGG database, thereby providing participants with the necessary practical skills. In addition, participants were equipped with practical skills on post-processing of breeding value solutions to build indices, and rank top bulls and cows.

Participants

A total of 8 females and 17 males participated in the course, with 4 participants from Tanzania, 8 from Ethiopia, 3 from Rwanda , 3 from Nigeria and 6 from Kenya. Chinyere Ekine-Dzivenu, a statistical geneticist in the International Livestock Research Institute (ILRI) Livestock Genetics team also participated in the course **on 13-17 December**. The participants from each country were either directly associated with current ADGG activities or sources of support to the national Dairy Performance Recording Centres (DPRCs) in each country.

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Course instructors

Enyew Negussie

Senior scientist

Natural Resources Institute Finland (Luke)

Finland

Martin Lidauer

Principal scientist

Natural Resources Institute Finland (Luke)

Finland

Prof. Raphael Mrode

Principal scientist, Quantitative dairy cattle genetics

ILRI , Nairobi, Kenya and Professor, Quantitative Genetics and Genomics, SRUC, Scotland

Course facilitators

Eric Anyona from the ILRI Livestock Genetics Team was in charge of all logistics and smooth running of the course with IT support provided by the ILRI ICT team.

Brief outline of proceedings of training course

- The course commenced at 09:00 hours using Zoom and finished at about 16.30 hrs daily, with a lunch and two coffee breaks. The lecture notes and materials for all practical for each day were stored in Microsoft Teams, which all participants had access to.

- The principal investigator (PI) for ADGG, Okeyo Mwai, then welcomed participants in the first day, gave an overview of ADGG and opened the training course.

- The course outline was presented by Enyew Negussie.

- The course then commenced. The main areas covered included introduction to Linux computing environment, editors, theoretical basis of GBLUP and GBLUP and Single step, the use of MiX99 software for BLUP models: animal, repeatability, multi-trait BLUP models and genomic models such as GBLUP and ssGBLUP. How to set up the instruction file (CLIM file) for MiX99, executing the software and interpretation of various outputs were covered. Also computation of reliabilities using the software was also taught in addition to the use of software Relax2 to compute the relationship matrix and Hginv to compute inverse of G of H matrix for ssGBLUP.

- The daily schedule was such that the presentation of lectures was interspersed with practical sessions and then theory sessions. The participants in each country were in one location for most of the countries, allowing them to work in groups in the practical sessions using Linux installed in their laptops.

- The practical sessions were based on an example data set on milk yield, body weight, pedigree and genotypes derived from the ADGG database.

- On the last day of the course, participants were given a lecture and practical sessions to equip them with practical skills on post-processing of breeding value solutions to build genomic indices, and ranking top bulls and cows for use in practice at their respective institutes.

- Finally, in the afternoon of the final course day a closing remark was given by each of the course instructors, and Okeyo Mwai, gave the final remarks and officially closed the training course.

- All participants received a certificate of attendance and a link to a repository containing all course materials.

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Outputs and outcomes

- Electronic lectures notes, software and practical examples on the of linear mixed models and use of MiX99 software for the prediction of breeding values and genomic selection.

- Procedure for the use of Linux environment for computing and data analysis.

- Lecture notes, steps and programs (R) for post processing GEBV solutions to build indices and rank top bulls and cows

Expected outcome

NARS equipped with practical skills in methods for animal quantitative genetics to effectively manage their respective national dairy and livestock performance recording and the use of MiX99 software for genetic evaluation systems.

Established network between NARS in Tanzania, Kenya, Nigeria, Uganda and Rwanda and Ethiopia in supporting each other in running of the DPRCs in each country.

Conclusions

- Participants were brought up-to-date on methods in quantitative genetics and the use of MiX99 software for the practical application of several genetic evaluation models. We feel the expected outputs and outcomes were achieved.

- The practical sessions afforded participants to use of MiX99 and other software, to work in the Linux environment and undertake breeding value prediction and their reliabilities. In addition, the training equipped them with skills to build indices and rank top bulls and cows.

- Basic skills of programming were also taught and the use of the Unix system.

- Participants felt stretched but also felt it was good training for them.

- The course afforded an opportunity for networking and future collaboration among participants and lecturers.

Other comments

The feedback from the participants was very positive and indicated they have learned a lot. Extending the course period by few days and especially dedicating the first one or two days of the course for covering exclusively Linux operating systems, editors and computing environment issues were strongly suggested.