



INITIATIVE ON
Sustainable Animal
Productivity

A Training on Multi-Trait Selection Index and Random Genetic Analysis in Wolayta Sodo, Ethiopia

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International Center for Agricultural Research in the Dry Areas
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About SAPLING

CGIAR's Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING) is working in seven countries focusing on livestock value chains to package and scale out tried-and-tested, as well as new, innovations in livestock health, genetics, feed and market systems. SAPLING aims to demonstrate that improvements in livestock productivity can offer a triple win: generating improved livelihoods and nutritional outcomes; contributing to women's empowerment; and, reducing impacts on climate and the environment. Its seven focus countries are Ethiopia, Kenya, Mali, Nepal, Tanzania, Uganda and Vietnam.

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Background to training

A two-day advanced training session on Multi-Trait Selection Index, and Random Genetic Analysis was conducted in Wolaita Sodo city, in Ethiopia. The training specifically targeted researchers involved in implementing sheep and goat CBBPs. Pedigree and performance data collection, genetic evaluation, selection and optimization of the breeding program are integral components of sheep and goat community-based breeding programs in Ethiopia. CBBP has been implemented in Ethiopia since 2009, and substantial genetic progress has been attained for the traits considered in the program <https://hdl.handle.net/20.500.11766/10553>; <https://hdl.handle.net/20.500.11766/9696>.

However, there is still a room to maximize genetic progress. One way of maximizing genetic progress and overall benefit is possible by using more elaborated models in the analysis. So far, selection and genetic evaluation mainly focused on single traits which is six months weight. Inclusion of more traits in the selection via selection index approach allows to maximize the overall benefit. In addition, related to fast growth of lambs and cash need, farmers tend to sell animals before selection age leading to counter selection. Therefore, making selection decision at earlier age is an important move to consider in the design of a breeding scheme. Random regression analysis allows a longitudinal genetic evaluation. This will allow researchers to consider more traits in their breeding program and would allow them to make early age selection decisions.

The training session provided researchers with comprehensive insights into the concept and methodologies of multi-trait selection and random genetic analysis. This exposure enabled participants to grasp the benefits associated with utilizing multiple traits in breeding programs, capturing longitudinal genetic variation, and making informed selection decisions at an early age.

Such complex analysis requires a reasonably larger amount of dataset with a better quality. Preliminary analysis <https://hdl.handle.net/10568/135602> regarding the quality of data in [Dtreo](#) were also presented during the training session in order to address the important topic of data quality from recording to storage.

The training took place in Wolaita Sodu, Ethiopia and was attended by researchers from various regions across the country.

Location and modality

A face-to-face training was organized in Wolaita Sodo city, Ethiopia. It focused on multi-trait analysis and genetic analysis of longitudinal data, specifically emphasizing random regression analysis models. The main goal was to enhance researchers' skills in considering multiple traits in their selection process and analyzing longitudinal animal breeding data. Trainees were selected from advanced sheep and goat CBBP sites based on their previous experience in managing and analyzing genetic evaluation data. Sample data from an Ethiopian CBBP site was used as training material. Trainees practiced data preparation for multi-trait selection index and random regression analysis, as well as interpretation of the results. Post-training evaluations indicated a significant improvement in participants' knowledge and expertise in these areas, including their ability to write model scripts

and prepare data for analysis.

In addition, participants presented their progress in data capture and management and were invited to go through an assessment of the quality of data available in DTREO platform. After a discussion, a way forward to improve the quality and size of data in the DTREO platform were discussed.

Dates

Training on Multi-Trait Selection Index and Random Genetic Analysis took place for two days on October 12 and 13 2023.

Who conducted the training

The training was organized by SAPLING small ruminant ICARDA Ethiopia team. The training was prepared and provided by Tesfaye Getachew, Aynalem Haile and Berhanu Belay. Participants gained invaluable insights and practical knowledge essential for optimizing breeding programs and improving genetic management.

Objectives of the training

The objective of the training session was to equip researchers with a comprehensive understanding of the concept and methodologies of multi-trait selection and random genetic analysis. By providing this exposure, the training aimed to enable participants to recognize and appreciate the advantages of incorporating multiple traits in breeding programs. Additionally, the training aimed to facilitate participants' comprehension of how to capture longitudinal genetic variation and make well-informed selection decisions at an early age.

The training also aimed to highlight the importance of data quality in conducting complex analyses such as multi-trait selection and random genetic analysis. The training helped to encourage researchers to prioritize efforts in enhancing the accuracy, completeness, and reliability of their data to ensure more robust and reliable outcomes in their analyses.

Training agenda

October 12, 2023		
Time	Session	Who
08.30	Welcome, objectives and expectations, and introduction	Prof Berhanu
09.00	Progress update from each site	Kebede, Dereje, shanbel, Mulatu, Mebrahtu, Bekahegn, Tussa
10:30	Coffee Break	ICARDA
10:50	Progress update from each site	Zemedkun, Mulatu, Melkam, Oumer, Dugassa, Adissu, Ermias
12:00	Feedback from the preliminary analysis in data missing by Tesfaye	Berhanu
13:00-4:00	Lunch	
14:00	Practical training on selection index	Tesfaye/Berhanu/Aynalem
16:00	Coffee Break	ICARDA
16:20-17:30	Practical training on random regression analysis	Tesfaye/Berhanu/Aynalem
October 13, 2023		
9:00	Practical training on random regression analysis	Tesfaye/Berhanu/Aynalem
10:30	Coffee Break	ICARDA
11:00	Practical training on random regression analysis	Tesfaye/Berhanu/Aynalem
13:00-14:00	Lunch	ICARDA
14:00	Practical training on random regression analysis	Tesfaye/Berhanu
16:00	Coffee Break	ICARDA
16:20-17:30	Practical training on random regression analysis	Tesfaye/Berhanu/Aynalem

Training participants

The training was attended by a diverse group of 14 participants from different regions in Ethiopia, namely Tigray, Amhara, Oromia, South Ethiopia, Central Ethiopia, Southwest Ethiopia, and Assosa. The participants included representatives from the Ethiopian Livestock Development Institute. The selection criteria for trainees were based on their proficiency in implementing data management and analysis, as well as their previous proficiency in estimating breeding values and the genetic evaluation process within the context of the Community-based Breeding Program (CBBP).

Full training material including power point guided the training, example data file, R code to prepare data for analysis, WOMBAT parameter files were provided to all participants.

Comments and Next steps

During the progress evaluation and presentation of preliminary analysis, it was noted that there is a gap in data entry within the system. This finding served as a valuable lesson for all participants, who acknowledged the importance of improving the quality of their data based on the feedback received.

Furthermore, the advanced Community-Based Breeding Programs (CBBPs) reached a consensus to incorporate multiple traits in their selection process by combining traits according to their economic significance. Additionally, they agreed to adopt and implement random regression analysis whenever applicable, recognizing its potential benefits.

Moreover, the participants expressed their commitment to sharing the knowledge and insights gained during the training with their peers upon returning to their respective CBBP sites and institutions. This collective effort aims to enhance the overall understanding and implementation of improved breeding practices among their colleagues.

Photos



Training session on multi-trait selection and random genetic analysis in progress, with active participation and practice from researchers and attendees.



Researchers providing a progress briefing during the training session.

Annex 1: Training agenda

List of participants

Ser no	Name	Institution
1	Zelalem abate	Bonga Agricultural Research Center
2	Adisu G/Michael	Bonga Agricultural Research Center
3	Shanbel Besufekad	Debre Berhan Agricultural Research Center
4	Zeleke Tessema	Debre Berhan Agricultural Research Center
5	Mebrahtu	Abergelle Agricultural Research Center
6	Mulatu Gobeze	Sekota Dryland Agricultural Research Center
7	Bekahegn Wondim	Andassa Agricultural Research Center
8	Zemedkun Difabachew	Mekdelaba University
9	Dugassa Desalegn	Haramaya University
10	Tusa Gemechu	Bako Agricultural Research Center
11	Kebede H/Giorgis	Areka Agricultural Research Center
12	Dereje Dea	Arba Minch Agricultural Research Center
13	Ermias Belete	Wolaita Sodo Agricultural Research Center
14	Dagne Muluneh	Livestock Development Institute