Training Report

Capacity building training on the Soil and Water Assessment Tool (SWAT)

SWAT training at Arba Minch University
November 25 – December 1, 2023

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Abeyou W. Worqlul
Scientist - ICARDA

CGIAR
INITIATIVE ON
Livestock and Climate

[*Capacity building training participants, including the AWTi Scientific Director – photo credit to Fisha Gebreselase – AWTi cameraman*]

TRAINING REPORT

Capacity building training on the Soil and Water Assessment Tool (SWAT)

SWAT training at Arba Minch University November 25 – December 1, 2023

Arba Minch University recently hosted a comprehensive three-day capacity-building training focused on the practical application of the Soil and Water Assessment Tool (SWAT). This training material was meticulously developed and offered by the International Center for Agricultural Research in Dry Areas (ICARDA). The training program was generously sponsored by the Livestock and Climate Initiative (LCSR). A diverse group of participants, including university staff members and postgraduate students, were invited to attend. The selection process prioritized individuals with a strong interest in applying the acquired skills as they aspired to become future trainers in the field at the university.

The training commenced with the gracious opening by the AWTi Scientific Director, Dr. Bogale Gebremariam. He emphasized the significance of this training in strategically enhancing the skills of university staff members. He noted that this training will empower the university to make a substantial contribution to the nation's development through impactful research and training. Following the Scientific Director's insightful speech, Dr. Demelash Wondimagegnehu, Academic Affairs Director of AWTi, expressed gratitude for the valuable collaboration with ICARDA and highlighted the importance of such partnerships in fostering knowledge exchange and skill development within academic institutions.

The training focuses on training the participants in the use of the Soil and Water Assessment Tool (SWAT). SWAT is a comprehensive hydrological model designed to simulate and predict the impact of various land management practices on water quantity and quality within a specific watershed or river basin. It can also be used to evaluate the effects of rangeland management practices on soil erosion and surface runoff. Additionally, a key aspect of the training is instructing participants on the preparation of input data derived from various global data sources (See Annex-1).

The first half-day of training on November 25th was dedicated to providing an overview of the ICARDA and LCSR initiatives, followed by introducing the SWAT model. The introduction to the SWAT model was supplemented by real-world examples showcasing its applications across different regions in the area of evaluating the effects of land use change, climate change, and watershed management practices on environmental sustainability. During this session, participants received a detailed explanation of the capabilities of the SWAT model, which can be further explored at SWAT's official website (SWAT, http://swat.tamu.edu). Also, the participants have collected relevant software, data, and reference material needed for the training.

Following the afternoon of the first day through the third half-day, participants actively participated in SWAT training sessions. These sessions covered various aspects of the SWAT model, including input data preparation such as land use, soil, and climate data, SWAT model setup, the execution of the SWAT model, and manual model calibration.

Throughout the SWAT session, participants received education on both the theoretical foundations of SWAT model development and its practical applications. The training provided

hands-on experience in multiple areas using local data, encompassing tasks such as data preparation, watershed delineation, hydrological response unit definition, model setup and execution, model calibration, and scenario development.

On the concluding day of the training, held on December 1st, participants regrouped to delve into a comprehensive case study focusing on the application of SWAT in Ethiopia. This segment involved tasks such as preparing input data, configuring SWAT parameters, and manually calibrating the SWAT model to replicate observed streamflow and soil loss patterns at the watershed outlet accurately. Additionally, participants had the opportunity to present their findings and engage in discussions regarding potential applications of the SWAT model, contributing valuable input based on their specific needs and perspectives.

The session had a total of 11 attendees, including two women (See Annex -2). The closing remarks were thoughtfully delivered by the AWTi Scientific Director, and the training concluded with the distribution of certificates to acknowledge the participants' successful completion. The trainees expressed gratitude for the opportunity, stating that the training enhanced their skills in teaching and research. They also acknowledged the substantial benefits gained from learning how to utilize SWAT for data processing and understanding the hydrological process at a watershed scale. They also requested advanced SWAT training focusing on uncertainty analysis, automatic calibration, and input uncertainty.

Annex - 1 Agenda of the Training

Capacity building training on the Soil and Water Assessment Tool (SWAT)

November 29 – December 1, 2023

Arba Minch, Ethiopia

Training Objective: Equipping participants with fundamental skills in preparing input data and executing the SWAT model to assess the impacts of diverse land management practices within the watershed.

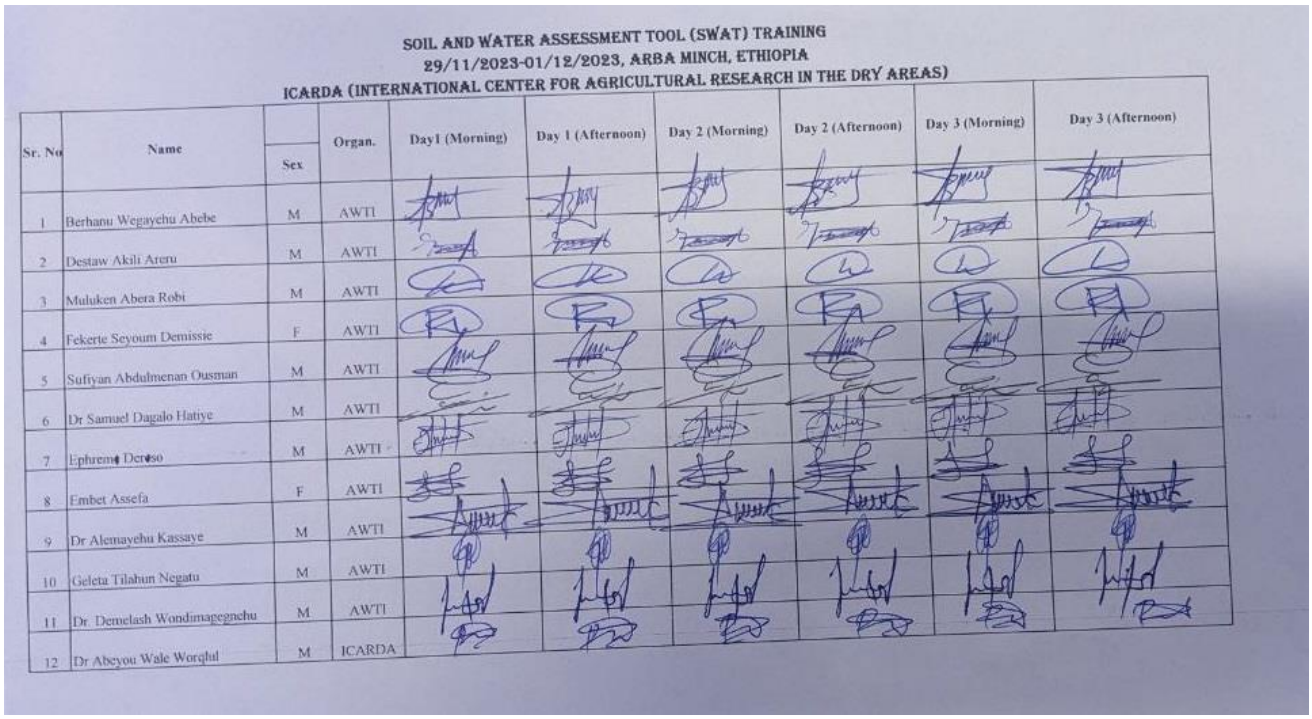
Participants: LCSR Livestock and Climate Initiative stakeholders and staff and graduate students of Arba Minch University

Agenda

Date	Activity	Note
Day1: Wednesday, November 29, 2023		**Arba Minch University**
08:30 – 10:00	Registration and Welcome Introduction to the SWAT model and its application	Dr. Demelash and Abeyou Worqlul
10:00 – 10:30	Tea break	
10:30 – 12:30	SWAT model input data pre-processing - Climate data preparation - Land use data preparation - DEM data preparation	Abeyou Worqlul
12:30 – 13:30	Lunch break	
13:30 – 15:00	SWAT model input data pre-processing - Soil data preparation - Preparing monthly weather statistics	Abeyou Worqlul
15:00 – 15:30	Tea break	
15:30 – 17:00	SWAT model setup - Delineating the watershed - Delineating river network	Abeyou Worqlul
Day 2: Thursday, November 30, 2023		**Arba Minch University**
08:30 – 10:00	SWAT model setup continuation - Overlaying soil and land use data - Creating HRU	Abeyou Worqlul
10:00 – 10:30	Tea break	
10:30 – 12:30	SWAT model setup continuation - Adding climate data - Adding management data	Abeyou Worqlul
12:30 – 13:30	Lunch break	
13:30 – 15:00	SWAT model setup and running	Abeyou Worqlul
15:00 – 15:30	Tea break	
15:30 – 17:00	Model Execution and Output Interpretation	Abeyou Worqlul

Date	Activity	Note
Day 3: Friday, December 1, 2023		**Arba Minch University**
08:30 – 10:00	SWAT model performance evaluation using multiple performance indicators (R-square, PBIAS, NSE, etc.)	Abeyou Worqlul
10:00 – 10:30	Tea break	
10:30 – 12:30	SWAT model editing continued	Abeyou Worqlul
12:30 – 13:30	Lunch break	
13:30 – 15:00	SWAT model manual calibration continued	Abeyou Worqlul
15:00 – 15:30	Tea break	
15:30 – 17:00	SWAT model manual calibration continued, and closing	Abeyou Worqlul

Annex 2 Attendance of the Training Participants



SOIL AND WATER ASSESSMENT TOOL (SWAT) TRAINING
29/11/2023-01/12/2023, ARBA MINCH, ETHIOPIA
ICARDA (INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS)

Sr. No	Name	Sex	Organ.	Day1 (Morning)	Day 1 (Afternoon)	Day 2 (Morning)	Day 2 (Afternoon)	Day 3 (Morning)	Day 3 (Afternoon)
1	Berhanu Wegayehu Abebe	M	AWTI						
2	Destaw Akili Areru	M	AWTI						
3	Muluken Abera Robi	M	AWTI						
4	Fekerte Seyoum Demissie	F	AWTI						
5	Sufiyan Abdulmenan Ousman	M	AWTI						
6	Dr Samuel Dagalo Hatiye	M	AWTI						
7	Ephrem Deroso	M	AWTI						
8	Embet Assefa	F	AWTI						
9	Dr Alemayehu Kassaye	M	AWTI						
10	Geleta Tilahun Negatu	M	AWTI						
11	Dr. Demelash Wondimagegnehu	M	AWTI						
12	Dr Abeyou Wale Worqlul	M	ICARDA						

Annex – 3 Snapshots captured at the training and certification ceremony.

Personal information including Name, Business Title, Email, Phones, Images and GPS points included in this report have been authorized in writing or verbally by the data subject.

The **CGIAR Research Initiative on Livestock and Climate** is designed to address the challenges that climate change poses to livestock production, providing livestock-keeping communities with the support they need without accelerating greenhouse gas emissions or degrading land, water, and biodiversity.

It forms part of CGIAR's new Research Portfolio, delivering science and innovation to transform food, land, and water systems in a climate crisis.

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