

## **Training Workshop on The Integrated Decision Support System Hosted by Sokoine University of Agriculture Morogoro, Tanzania**

The Sokoine University of Agriculture (SUA) hosted an international training workshop on the Integrated Decision Support System (IDSS) from July 27<sup>th</sup> to July 31<sup>st</sup>, 2015 in Morogoro, Tanzania. The training was conducted under the Feed the Future USAID Innovation Laboratory for Small Scale Irrigation; Texas A&M is the lead institution for this project. The IDSS is part of the overall research being done under this laboratory in Tanzania in collaboration with Texas A&M, North Carolina A&T State University, and the three CGIAR centers: the International Water Management Institute (IWMI), the International Livestock Research Institute (ILRI) and the International Food Policy Research Institute.

This training was conducted by a team of practicing scientists from Texas A&M. The training targeted graduate students and young scientists with background in economics, agronomy, animal science, water resources, hydrology and agricultural engineering. Trainees learned about three component models and their integrated use to provide a holistic assessment of the impact of alternative interventions in food and agriculture. The models are:

- **Agricultural Policy/Environmental eXtender Model (APEX) (Apex.tamu.edu)** -farm or field scale for agronomists, animal scientists, soil scientists, crop production, environmental impacts,
- **Farming Simulator (FARMSIM)** - agricultural economists or people with economic understanding, and
- **Soil Water Assessment Tool (SWAT) (swat.tamu.edu)** - hydrologists, agricultural engineers, water resource professionals.

The training on each model was conducted in parallel, except on first and last day of the event, where all participants will be together to experience the integrated modeling approach and learn from case studies.

A total of 51 participants attended the workshop, of which 23 attended the SWAT workshop, 15 attended the APEX workshop, and 13 attended the FARMSIM workshop. Nine of the 51 participants were women (with six attending the SWAT workshop and three attending the APEX workshop). 36 participants were affiliated with a university in some capacity (whether as students, professors/lecturers, or researchers)—27 with SUA, eight with other Tanzanian universities (University of Dar Es Salaam, Mzumbe University and Moshi Cooperative University), and one from the University of California Davis. The remaining 15 participants represented a range of research institutes and government ministries. Most of the participants reported holding master in science or doctorate degrees in engineering, economics/business, agronomy, horticulture, hydrology, water resources management, environmental sciences, geology, ecology, agriculture, natural sciences, or forestry.

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According to surveys of the participants, none of the students had significant knowledge of the IDSS prior to the workshops. None of the students indicated that they could use any of the IDSS models prior to the class, and all students answered either “disagree” or “strongly disagree” to statements indicating prior model knowledge (e.g., knowledge of model setup, purpose, interface).

Introductory SWAT and advanced SWAT training was presented by Yihun Dile and based on a dataset at the Robit watershed in Ethiopia. Introductory SWAT training covered theory of the SWAT modelling paradigm, data preparation (e.g., building a database, spatial data projection, the weather generator), watershed delineation, HRU definition, implementation of ex ante interventions, and model simulations. The introductory training used publicly available QSWAT (which uses QGIS-Quantum GIS). Even those who previously used ARCSWAT were pleased with some of QSWAT’s added features.

The APEX workshop, presented by Javier Osorio, was divided into three components: (1) an introductory/theoretical section; (2) a hands-on section where participants could familiarize themselves with the WinAPEX interface; and (3) a section on model evaluation and demonstration of the APEX Calibration and Uncertainty Estimator (APEX-CUTE) tool. Participants responded well to the instructors as they participated in the hands-on exercises and queried instructors with highly relevant questions.

The FARMSIM workshop was presented by Jean-Claude Bizimana and addressed the following topics: (1) an introduction to the concept of risk; (2) the use of EXCEL and SIMETAR to analyze risk; (3) the fundamentals of statistics and econometrics to estimate risk; (4) a FARMSIM model overview; and (5) data source and entry in FARMSIM. The final day was dedicated to a hands-on exercise whereby a “virtual farm” was simulated assuming the adoption of a selected irrigation technology. Participants in the workshop demonstrated great interest in the FARMSIM model and its usefulness in analyzing the risks of agricultural interventions.

A detailed student questionnaire was administered at the close of the workshop and provides detailed feedback on both content and presentation. Responses were uniformly very positive; participants generally felt they received training to meet their expectations and that they would be able to apply the training to their further studies and research.



## **Feed the Future Innovation Laboratory for Small Scale Irrigation (FtF-ILSSI)**

### **Activities in Tanzania**

The FtF-ILSSI is being conducted under a cooperative agreement funded by USAID to undertake research to increase food production, improve nutrition, accelerate economic development and contribute to the protection of the environment. The project pursues these objectives through identifying, testing and demonstrating technological options in small-scale irrigation and irrigated fodder, supported by a continual dialogue approach with stakeholders and capacity development toward sustained use of research approaches and evidence. The FtF-ILSSI was initiated in August 2013. The cooperative agreement is entering its third year. After initial extensive stakeholder consultation at multiple levels and meetings with farmers and local leadership, the site selection for field research in Tanzania has been completed and research in farmer's fields and households initiated.

Field studies are being undertaken through close collaboration with Sokoine University of Agriculture. The project's research interventions are being piloted in two sites in the Wami River sub-Basin. The sub-Basin is part of the Wami-Ruvu River Basin, which is among the nine major river basins in which irrigated agriculture is practiced in the country. The pilot interventions are structured around differing water lifting devices used for testing the scaling up of the system for rice intensification (SRI) and tower (drip) gardening (with NCAT). Surface water (streams, river, ponds, etc.) and groundwater, either from open well or bore-wells/shallow wells constitute the main water sources in the study case sites. Farmers in both watersheds usually own small farms of about 0.75 acres on average and use traditional means (usually buckets) to draw water from the water sources. At each site 16 households have been selected with an even split in gender. These households have agreed to trial new pumps with the agreement from revenue they will pay back into a group bank account. For the SRI experiment the intention is to examine and suggest improvements to water productivity. For this, contiguous blocks of approximately 50 farmers with ranging ownership and management styles are being selected. Currently work is well advanced in providing baseline survey, biophysical characterization and installation of monitoring equipment. Drip irrigation studies on kitchen gardens involving women farmers are being conducted in Kilosa and Mvomero, in the Morogoro region of Tanzania. Research on forage-livestock systems is being initiated via meetings with prospective partners in Morogoro with the Tanzania Livestock Research Institute (TALIRI). These studies will be conducted at the Africa RISING Babati site.

Initial household surveys aimed at determining the impact of small scale irrigation as it affects gender, family nutrition, and gender in areas surrounding the field test sites are completed working closely with Sokoine University of Agriculture to implement the survey. These baseline surveys will be followed by a second round which evaluate the impact of small scale irrigation in the areas under study.

The Agricultural Policy/Environmental eXtender (APEX), Soil and Water Assessment Tool (SWAT), and FARMSIM models are used to provide an Integrated Decision Support System (IDSS) for ILSSI research in Tanzania. APEX is used to estimate the biophysical implications at a farm scale while SWAT assesses the environmental sustainability at a watershed scale. The FARMSIM model assesses the impacts on

production and nutrition as well as the economic consequences of adopting small-scale irrigation on farms. Application of the IDSS in Tanzania will initially involve ex ante analyses of areas surrounding the sites for field research and will be initiated in October 2015.

A full three model integrated ex ante analysis of small scale irrigation interventions in the Robit area of Ethiopia has been completed, demonstrating environmental, production, and economic consequences. The consolidation of methodologies and refined methods of acquiring and sharing data with the integrated analysis will serve as a model for similar assessments being initiated in Tanzania. The ILSSI External Advisory Committee met in Morogoro on July 27, 2015 and was highly complementary of the progress made on the IDSS.

A training workshop on the IDSS was sponsored by Sokoine University of Agriculture and Texas A&M during the period July 27-31, 2015 with 52 students from SUA and other national institutions and other faculty and scientists interested in application of the IDSS.

In summary, research, education, and outreach are actively underway and results will be generated in the coming months. The ILSSI team hopes to continue the engagement and dialogue with the USAID Mission in Tanzania, seeking guidance on how to make the work more relevant and for opportunities to be of service to the Mission in their ongoing or future studies.

The following pictures are of ongoing studies in Tanzania using drip irrigation and involving female Farmers.



**Women of Kilosa (left) and Mvomero (right), Morogoro, Tanzania**