

Innovation Lab for Small Scale Irrigation

Results and Impact of IDSS workshops in Tanzania

Introduction

The USAID Feed the Future Innovation Laboratory for Small-Scale Irrigation (ILSSI) was formed to undertake research aimed at increasing food production, improving nutrition, accelerating economic development, and contributing to the protection of the environment in Ethiopia, Ghana and Tanzania. Texas A&M University leads the project in collaboration with the International Water Management Institute, the International Livestock Research Institute, North Carolina A&T State University, and the International Food Policy Research Institute.

ILSSI is currently working to generate actionable recommendations for strategic investments in agricultural development in the three target countries by integrating: natural resources, agricultural, and socioeconomic data; input from local farm families; local agronomic research and demonstrations; and the Integrated Decision Support System (IDSS), a powerful suite of natural resource, agronomic, and farm-scale economic models. ILSSI also emphasizes capacity development at multiple levels of scale, including training university faculty and students, and representatives from government agencies, non-governmental organizations, and the private sector to continue using ILSSI tools and methodologies after this five-year project is completed.

As part of its training mission, ILSSI has conducted multiple training sessions in the IDSS and its three component models: the Soil and Water Assessment Tool (or SWAT, at <http://swat.tamu.edu>), the Agricultural Policy/Environmental eXtender (or APEX, at <http://epicapex.tamu.edu>) and the Farm Income and Nutrition Simulator (or FARMSIM, at <http://afpc.tamu.edu>). Simetar© (Simulation for Excel to Analyze Risk), referenced below, is the simulation engine used to simulate the FARMSIM model.

The IDSS team has led two IDSS training workshops in Tanzania. A workshop sponsored by the Sokoine University of Agriculture (SUA) was held July 27-31, 2015, in Morogoro, Tanzania. A workshop sponsored by the Nelson Mandela African Institute for Science and Technology (NM-AIST) was held June 6-10, 2016, in Arusha, Tanzania. This report describes the participants, content, evaluations, and effectiveness of the Tanzania workshops.

Number of participants and their affiliations

A total of 51 participants attended the 2015 workshop, of which 23 attended the SWAT workshop, 15 attended the APEX workshop, and 13 attended the FARMSIM workshop. Of the 51 participants, 9 were women, with 6 attending the SWAT workshop, and 3 attending the APEX workshop. 36 participants were affiliated with a university in some capacity (whether as students, professors, lecturers, or researchers)—27 with SUA, and 8 with other Tanzanian universities. The remaining 15 participants represented a range of research institutes and government ministries.

A total of 46 participants attended the 2016 workshop, of which 24 were trained in SWAT, 14 in APEX and 8 in FARMSIM. Of the 46 participants, 13 were women, with 7, 4, and 2 women attending the SWAT, APEX, and FARMSIM workshops, respectively. A majority of workshop participants represented universities such as the NM-AIST. Other participants represented international and local research institutions, such as the International Center for Tropical Agriculture and the Water Development and Management Institute. Four participants represented

government ministries such as the Ministry of Water and Irrigation and the Ministry of Agriculture, Livestock and Fisheries. Figure 1 illustrates the makeup of the 2015 and 2016 workshops by gender and organizational affiliation.

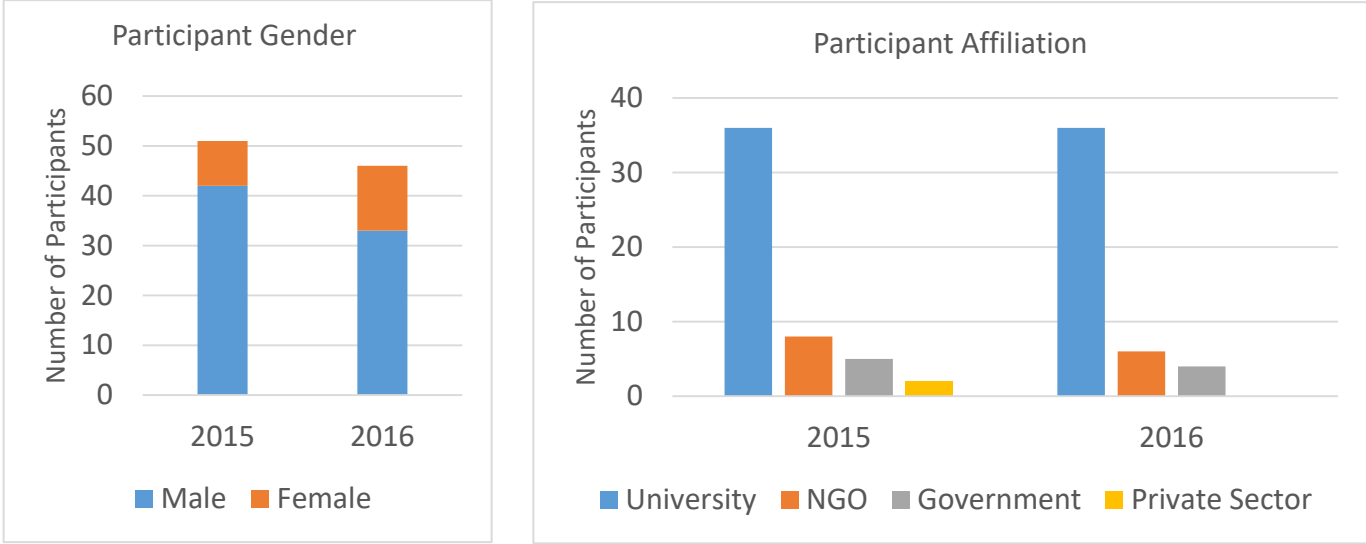


Figure 1. Participation at Morogoro and Arusha workshops by gender and affiliation.

Workshop content and structure

The first half-day of the 2015 and 2016 workshops consisted of an overview of the IDSS and its three component models. From the afternoon of the first day through the fourth day, participants attended individual model trainings in either SWAT, APEX or FARMSIM. On the fifth day, participants came back together as a group for an in-depth case study of the integrated capabilities of the IDSS (drawn from ILSSI studies in Tanzania) and a hands-on integration exercise. Finally, participants were divided into groups (each consisting of at least one trainee for each of the three models) to work together on the integration of their individual modeling results.

Participant evaluations of the workshops

Prior to the IDSS workshops, the IDSS team required each participant to complete an online survey ranking his or her competence in the following areas pertaining to SWAT, APEX or FARMSIM: depth of understanding of the general subject matter; level of experience with relevant software, tools, and databases; and ability to perform certain relevant modeling tasks. Table 1 lists a sampling of these “competence questions” for each of the three IDSS models.

Following the workshops, participants were asked to complete a second online survey ranking their knowledge and competence post-workshop. (The “competence questions” included in the post-workshop surveys were identical to those posed in pre-workshop surveys and listed in Table 1.) Participants were asked to assess whether course content was delivered as advertised and expected learning outcomes achieved. They were also asked to rate course materials, instructor content and presentation, overall quality of the workshop, and how well the workshop met the participant’s particular needs. Finally, participants were asked to make recommendations as to future course content.

Table 1. “Competence” questions in the SWAT, APEX, and FARMSIM workshop surveys

SWAT
<p>SWAT workshop participants were asked to rank their ability to, among other things:</p> <ul style="list-style-type: none"> • prepare spatial and temporal data and soil and land use tables • set up a watershed delineation model and a Hydrological Response Unit definition • write different inputs into the SWAT readable format • edit and update model parameters and databases • define model execution and warm-up periods • use the tool SWAT-check to assess water balance components, nutrient transports, erosion, crop growth • use QSWAT to animate and plot model outputs • simulate different fertilizer rates and types and different tillage practices • select suitable irrigable crops and identify irrigable areas for different crops
APEX
<p>APEX participants were asked to rate, among other things, their:</p> <ul style="list-style-type: none"> • proficiency in file management, text processing software, spreadsheets, and database management • understanding of the purpose, basic setup, structure, and file system of the APEX model, the structure of APEX outputs, and basic concepts of model evaluation • ability to define certain terms (such as relative sensitivity analysis, calibration, and validation) <p>In addition, APEX participants were asked to rank their ability to:</p> <ul style="list-style-type: none"> • run the APEX model using WinAPEX interface and use, modify and update WinAPEX databases • prepare weather data files, soil data, management files, and scenarios using WinAPEX • perform relative sensitivity analysis, and manual and automatic calibration and validation • generate output data for SWAT and FARMSIM
FARMSIM
<p>FARMSIM participants were asked to rate, among other things, their:</p> <ul style="list-style-type: none"> • understanding of farm management, agricultural economics, and statistics • understanding of and ability to use Excel, Excel tools, and risk/data analysis tools in Simetar • understanding of FARMSIM model, model inputs/outputs, how model simulates risk and scenarios • ability to interpret stochastic results in SIMETAR and FARMSIM • ability to interpret, obtain and input data, and to verify data entry • ability to determine and interpret results from the models

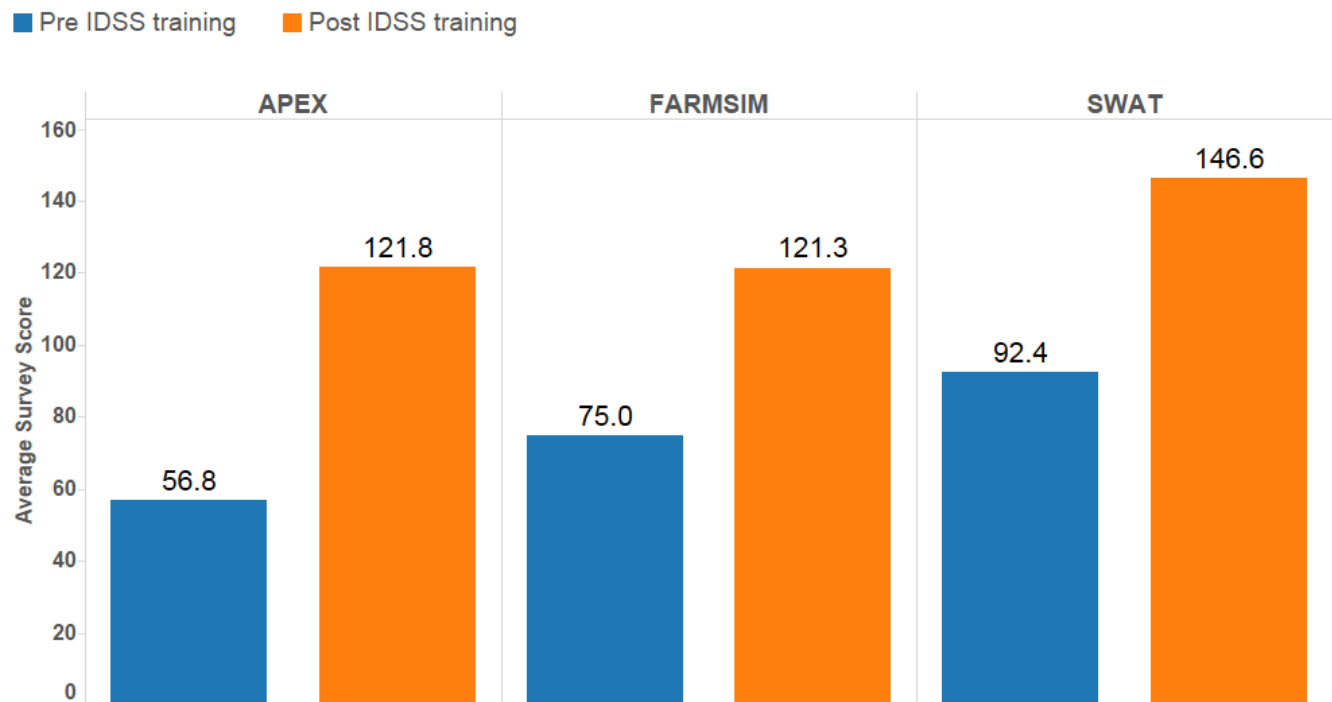
Assessment of effectiveness

Following the IDSS workshops, the IDSS team compared the responses on the pre- and post-workshop “competency questions.” These questions were identical in the pre- and post-workshop surveys. Since respondents ranked their abilities from 1-5 (with 1 being the lowest level of competence and 5 the highest), higher scores indicated a higher level of competency.

The answers of each respondent to all of the “competency questions” in the pre-workshop survey were totaled, creating a pre-workshop competency score for that respondent. The scores of each of the respondents were then averaged to produce the average pre-workshop competency score for respondents. The same process with respect to post-workshop survey responses produced an average post-workshop competency score for respondents.

Comparison of these average scores provides a general (though not necessarily objective) measure of the workshop’s effectiveness in achieving advertised learning outcomes.

For example, [Figure 2](#) compares the average pre-workshop and post-workshop competency scores for each IDSS model training session at the 2016 workshop. A total of 17 respondents completed the pre-workshop survey, of which 9 attended SWAT training, 4 attended APEX training, and 4 attended FARMSIM training. A total of 17 respondents completed the post-workshop survey, with 9 rating the SWAT training, 4 rating the APEX training, and 4 rating the FARMSIM training. These results indicate improvements in average post-workshop scores ranging from almost 60% to almost 115%. The team did not perform any statistical analysis (test of significance for difference in averages, etc.) of the survey responses.



	Pre IDSS training			Post IDSS training		
	APEX	FARMSIM	SWAT	APEX	FARMSIM	SWAT
Cumulative Score	227	300	832	487	485	1,319
Average Respondent Score	56.8	75.0	92.4	121.8	121.3	146.6
Percent Improvement				114.5%	61.7%	58.5%

Figure 2. Comparison of average pre-workshop and post-workshop competency scores for SWAT, APEX, and FARMSIM training sessions at the Arusha IDSS workshop.

The IDSS team also reviewed respondents’ evaluations of course content and overall quality, instructor content and presentation, and how well the workshop met the participant’s particular needs, as well as respondents’ suggested adjustments to course content in subsequent courses. In general, reviews were very favorable. 82% of respondents agreed or strongly agreed that the course content was as advertised, with 6% disagreeing, 6% strongly agreeing, and 6% remaining neutral. 100% of respondents rated instructor content as very good or

excellent. Likewise, 100% of respondents ranked instructor presentation as very good or excellent. 82% of respondents rated the overall quality of the course as very good or excellent, with 18% rating it as good. 88% of respondents said that the course exceeded their expectations.

In the comments section of the post-workshop survey, several participants were enthusiastic about applying the models in their research. One APEX course participant stated, “The training was a good investment of my time and I expect to immediately apply [t]he APEX and SWAT in my current work.” Likewise, a FARMSIM participant stated, “The workshop was very constructive, and it has contributed a lot to my work.”

Many participants also expressed an interest in additional training. A FARMSIM participant stated, “The IDSS workshop was good and interesting. I congratulate all who prepare this workshop. Also like to request if possible this nature of training to be conducted regularly to improve our research for proper policy advice.” Several participants commented that the training required more time, and recommended extending the workshop by a period of time (ranging from 1-2 additional days to 1-2 additional weeks).

Following completion of the workshops, the IDSS team has also continued to provide ongoing support and assistance to workshop participants. The FARMSIM team, for example, is in discussions with three former students from SUA regarding the use of the model in their current research:

- Andrew Rogers is preparing a paper entitled “Economic Viability of Newly Introduced Tropical Adapted and Improved Chicken Ecotypes at Village Level, Tanzania”;
- Charles Malakiis is conducting an analysis of farm economics and productivity in Tanzania; and
- Ibrahim Kadigi is studying the nutritional and economic status of farmers in Tanzania.

A fourth former student, Lutengano Mwinuka, has already applied the model in two research papers and is seeking to publish them.

Expected impact

The post-workshop interactions of the IDSS team with participants, like the survey responses noted above, indicate that many of the Tanzania workshop participants will use or have already begun using knowledge gained in the IDSS workshops in future and current research activities. Some of the participants are already engaged in ILSSI activities, and are now ready to apply what they have learned in the project.