Annex 4.9

Report on the training on water resources modeling

Federal Democratic Republic of Ethiopia

Ministry of Water Resources

Food and Agricultural Organization of the United Nations

Project: Strengthening national water monitoring capacities, with emphasis on agricultural water management (GCP/GLO/207/ITA)

Report on Training in Water Resources Modeling Conducted from August 17- 26, 2009

By

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1. Introduction

As per the ToR (Annex A) and contract entered into with FAO to deliver training in water resources and hydrological modeling, the training was successfully delivered from 17th August to 26th August, 2009 in the venue provided by the Ministry of Water Resources. Due to the advanced nature of the course a criterion was set, in consultation with the national coordinator, for selecting appropriate participants. The majority of the participants were either senior B.Sc or M.Sc degree holders in one of water related subjects. In terms of administrative coverage, they were drawn from the Regional State water Bureaus and the Federal MoWR, MoARD and Awash Basin Authority. The total number of participants attended the courses were 18 of which 10 were from Regional States and 5 from MoWR, 1 from MoARD and 2 Awash Basin Authority (Annex B).

The training was organized into theoretical component, model demonstration component and the practical exercise component. Belebela and Wedecha reservoir systems and the associated irrigation abstractions located around Debre Zeit were considered for the exercise session.

The subsequent section provides the training session and the participants' evaluation.

2. The Training Modules and Materials

The training session covered four components and a field trip at the end of the course. It was organized to cover fully the watershed delineation, the water yield /hydrology and water resources modeling component. Each training succession was accompanied with practical exercises and evaluation of the exercise. The key modules include:

- The theoretical basis of water resources planning and modeling principles (1 day)
- HEC-GeoHMS Model – Watershed delineation and derivation of watershed attributes (1 day)
- HEC-HMS Model – Hydrological Modeling System (1.5 day)
- HEC-ResSim Model – Water Resources Planning and Operation Model (4.5 days)
- Field Practice (1 day)

The schedule of training is attached as Annex C

The following materials and software were provided to the trainees for their reference and future use on DVD.

- Global Mapper and EthioDEM (Ethiopian DEM)
- ArcView 3.1 and associated documents
- HEC-GeoHMS and associated manuals and user guides
- HEC-HMS and associated technical and user manual
- HEC-ResSim and Associated user guides, Qucik start manuals
- Power point presentation
- The complete data set for Belbela-Wedecha reservoir system to be used for the exercise.

Two reservoirs with one treatment plant were visited some 30 km north of Addis Ababa. The reservoirs are for Addis Ababa water supply. The trainees were able to appreciate in the different components in the planning and operation of reservoirs based on the observation and explanation by the operation staff.

3. Course Evaluation

The training was evaluated by the participants of the workshop. The questionnaire was designed to reflect i) the theoretical and modeling capacity of the trainers' ii) the importance of the training for personal, institutional and national benefit, iii) achievement and future use of the model, iv) the training duration v) teaching materials in v) the training material/software, vi) organization and logistics service by the organizers (See, evaluation form in Annex B). The overall training as well as the logistics service was generally rated by the trainers as outstanding with performance rating of very good and above (83%) indicating the high degree of satisfaction of the participants in the training. As shown in the table below (abstracted from the questionnaire response – Annex D), the participants concern was more on the limited duration of the training than other items. The participants indicate the training was highly significant (92%) and they intend to use in their future carrier (84%).

No.	Summarized Evaluation Items	E (%)	VG (%)	G (%)	P (%)	(E+VG) (%)
i	The content and delivery of the raining	66	32	2	0	98
ii	Significance of the training	71	21	6	2	92
iii	Achievement and future use of the model	20	64	11	4	84
iv	Adequacy of the duration of the training	13	46	35	7	59
v	The training materials/software	47	47	4	2	94
vi	Organization and logistics service by the Organizers (FAO, MoWR)	28	44	19	9	72
Overall training efficiency		**42**	**41**	**13**	**4**	**83**

4. Recommendation for Future Capacity Building

On the basis of the participants' response indicated from Q9 to Q11 (Annex D), the key recommendations for future capacity building are given as follows:

- Participants strongly recommended similar trainings are very essential for planning and management of the water resources of the country and shall be provided continuously
- Duration was not adequate for the training and requires additional time to grasp the concept and the operations of the model fully.

Continuing from the participants suggestions, the trainer recommends the following points for capacity building in water resources management in future

- The water yield component (the hydrological component) can be delivered as one independent module. Including the theoretical concepts and the demo and the exercises, the whole exercise may take about 7 days
- The Water Resources component – this can further be viewed into as the planning and the operation component. The planning component includes the watershed delineation, the input preparation, incorporation of the development potentials and storage facilities (if any) and may take about 12-13 days distributed into 7 days for planning and the balance for operation component.
- Both hydrologic and water resources modeling including water yield estimation (inflow estimation) and the water resources planning will take about 20 days. This can be set as a continuous training organized twice a year or once a year depending on the availability of the budget.

Annex A: TOR

Project: Strengthening national water monitoring capacities, with emphasis on agricultural water management (GCP/GLO/207/ITA)

Terms of Reference

National Consultant: Hydrologist (30 days)

Under the general supervision of the Technical Adviser, the direct supervision of the National Project Coordinator, and in close collaboration with the FAO Emergency Unit, the Programme Section of FAO Ethiopia, the Ministry of Water Resources (MoWR), the incumbent will conduct a training course on hydrological modelling in river basins, including water balance and water use models, for selected staff of the Ministry of Water Resources, Regional Water Bureaux, and Basin Agencies. In particular, s/he will:

- Select the model which will be used as basis for the training in close cooperation with the Chief Engineer, the Head of the Hydrology Department and the Head of the GIS and Metadatabase Unit, National Project Coordinator and other relevant staff at the MoWR as well as National Water Use Survey Consultant, according to the following criteria:
    - Accessibility (Public Domain)
    - Ease of Use
    - Past Applications in Ethiopia
    - Familiarity of MoWR staff with the software
    - Relevance of features and functionality
- Present a detailed outline of the training course;
- Prepare the training materials, including handouts and software;
- Assist the National Project Coordinator in identifying a suitable venue for the training course with the necessary infrastructure and facilities;
- Assist the above MoWR staff in setting criteria for the selection of the training participants;
- Conduct the training course (duration: 10 days) which includes demonstration of model and practical exercises on selected catchments;
- Assist the national Coordinator and Water use Survey Consultant in organizing field trip;
- Document a training course;

- Perform any other related tasks as and when requested by the Technical Advisor, the National Project Coordinator and the Water Use Survey Consultant

Products:

- Detailed outline of the training course
- Training materials
- Report on the training including recommendation for further capacity building in the field of hydrological modeling

Duty Station: Addis Ababa

Minimum requirements: Advanced degree in hydrology, at least 8 years experience in the application of hydrological models in water balance and water use studies; training experience; working knowledge

Annex B: List of Trainees

S No	Name	Organization	telephone	e-mail	Profession
1	Sewenet Eshetu	Amhara BoWRD	0910898872	sewneteshet@yahoo.com	Irrigation Ing.
2	Melkes Ukbey	Tigray BoWR,ME	0913631995	Melki_uk@yahoo.com	Hydraulic Ing
3	Yalew Belete	MoARD	0911988528	yayordi@yahoo.com	Irrigation Ing.
4	Assefa Hirpassa	Awash Basin Auth	0911843033	Awashbwraa@ethinet.et	Irrigation Ing.
5	Muluken Wondie	Awash Basin Auth	0913864587		Irrigation Ing.
6	Mohammed Hassen	MoWR	0911301008	mhmmdhassen@yahoo.com	Hydraulic Ing
7	Walea Wittica	Afar WR Bero	0911717742		Water Resource Eng.
8	Solomon Chere	MoWR	0911887678	solommeherie@yahoo.com	Irrigation Ing.
9	Tesfaye Abebe	MoWR	0911657341	tesfayeabb@yahoo.com	Irrigation Ing.
10	Addisu Shimekaw	MoWR	0911764212	addishikaw@yahoo.com	Irrigation Ing.
11	Menu Abas	SNNPRS, WRDB	0911669325	menuabasgg@yahoo.com	Hydraulic Ing
12	Zelalem Fisseha	Tigray: WRMEB	0914701045	zelalemdi@yahoo.com	Hydrology
13	Awelu Ali	SNNPRS, WRDB	0916137330		Irrigation Ing.
14	Fithawi Embaye	Tigray BoWR.ME	0913422028	fthawiembaye@yahoo.com	Water Supply & Environmental
15	Melese Sentayehu	Amhara BoWRD	0918767731	melesesentayehu@yahoo.com	Irrigation Ing.
16	Tesfaye Abebe	MoWR	0913416906	tes.mowr@gmail.com	Irrigation Ing.
17	Samuel Hussen	Orimiya	0911118481	samiogeto@yahoo.com	Irrigation Ing.
18	Demelash Mulun	Oromiya			

Annex C: Water Resources Planning Model

Organized by FAO and MoWR

Training Schedule

August 17 to 26, 2009

Date	Topics	Facilitator
Monday 17, August 2009		
08:00 – 09:00	**Registration**	**FAO/MoWR**
09:00 – 09:00	Welcoming Addresses and Remarks	FAO/MoWR
09:30 - 10:00	Installation and Setup of the Software with Students	Dr. Semu
10:00 – 10:30	**Tea Break**	**Logistics**
10:30 – 12:00	Principles and Procedures of Modeling in Water Resources	Dr. Semu
12:00 – 12:30	Q& A, Discussion	
12:30 – 14:00	**Lunch**	**Logistics**
14:00 – 15:30	Types and Classification of Models in Water Resources	Dr. Semu
15:30- 16:00	**Tea Break**	**Logistics**
16:00 – 16:30	Q & A, Discussion	
16:30 – 17:30	Types and Classification of Models in Water Resources (Cont'd)	Dr. Semu
Tuesday 18, August 2009		
09:00 – 10:00	Theoretical background of HEC-GeoHMS	Dr. Semu
10:00 – 10:30	**Tea Break**	**Logistics**
10:30 – 12:00	Theoretical background of HEC-GeoHMS (Conti'd)	Dr. Semu
12:00 – 12:30	Q&A, Discussion	
12:30 – 14:00	**Lunch**	**Logistics**
14:00 – 15:30	Exercise on watershed delineation using HEC-GeoHMS	Dr. Semu
15:30: 16:00	**Tea Break**	**Logistics**

16:00 – 17:30	Exercise on watershed delineation using HEC-GeoHMS (Cont'd)	Dr. Semu
Wednesday 19, August 2009		
09:00 – 10:00	Hydrological Model demonstration (HEC-HMS)	Ato Yared/Dr. Semu
10:00 – 10:30	**Tea Break**	**Logistics**
10:30 – 12:00	Exercise on HEC-HMS Model	Dr. Semu
12:00 – 12:30	Exercise on HEC-HMS Model	Dr. Semu
12:30 – 14:00	**Lunch**	**Logistics**
14:00 – 15:30	Exercise on HEC-HMS Model	Dr. Semu
15:30: 16:00	**Tea Break**	**Logistics**
16:00 – 17:30	Exercise on HEC-HMS Model	Dr. Semu
[1]Thursday, 20th to Saturday, 22nd August, 2009 – Application of the Model to Ethiopia		
20th August	Water Resources Planning and Models Theoretical background of HEC-ResSim Model	Dr. Semu
21st August	Application of the Model to Belbella Catchment	Ato Wakena/Dr.Semu
22nd August	Application of the Model to Belbella Catchment	Ato Wakena/Dr.Semu
Sunday, 23rd of August, 2009 - Holiday		
Monday 24th to 26th August 2009 – Independent Exercises and Evaluation		
24th August	Independent Project Work	Ato Wakena/Dr.Semu
25th August	Independent Project Work and Evaluation	Ato Wakena/Dr.Semu
26th August	Filed work and Certification	Ato Wakena/Dr.Semu

[1] The usual **Tea** and **Lunch Time** Breaks will also be maintained after Thursday.

Annex D: Evaluation form

Water Resources Planning Model

No.		Evaluation Grade				
1.		**Excellent = 5**	**V. Good =4**	**Good = 3**	**Poor = 2**	**Total**
	The Training Course					
1	The contents of the course	41	20	1		
1.1	The theoretical/Scientific contents	//////////////	//			16
1.2	The Conceptual framework of modeling	///////////	/////			15
1.3	The contents of the exercises	////////////	////			15
1.4	Facilitation Skills of the trainers/interaction	/////	/////////	/		15
2	Significance of the training	34	10	3	1	48
2.1	To your institutions water management operation	///////////	///	/	/	16
2.2	To your Immediate work/project	////////	//////	//		16
2.3	Importance of the course to the country	//////////////	/			16
3.	Expected Achievements	9	29	4	2	
3.1	How much have you gained from the training?	///	////////////			16
3.2	Do you think you can improve the water management issues in your region using the model?	///	//////////	/		14
3.3	What is the level of acceptance of model usage in your office/region?	///	//////	////	//	15
4	Duration of the training (if adequate = 5, if not totally inadequate= 2 or other intermediate grades)	6	21	16	3	
4.1	Adequacy of duration of each training module	///	/////	//////	//	16
4.2	Adequacy of duration for the exercises	/	///////	///////		15
4.3	Overall duration for the training	//	/////////	///	/	15
5	Teaching Materials/Logistics provided to you	25	31	5	3	
5.1	Power point materials	////////	///////		/	16
5.2	The software materials	/////////	///////			16
5.3	Teaching aids/manuals	/////	////////	//		15
5.4	Training Hall and facilities	///	////////	///	//	16
6	Other Logistic Services	19	26	12	5	
6.1	Tea break/Lunch/related services	//////	//////	///		15
6.2	Convenience of the training venue	/////	/////	////	//	16
7	The facilitation provided by FAO	/////	//////	///	//	16
8	Facilitation provided by MoWR	///	/////////	//	/	15
	Future Training					
9	Which part of the training component shall be improved?					
10	How should you think the training should be delivered in the future?					
11	Overall recommendation on future training requirement (similar or different)					