

Terms of Reference for Butajira – Ziway Areas Development Study

1. Background

JICA and MoWR launched a new project called EWTEC Project (Ethiopia Water Technology Center Project) in Mar. 2005, replacing the Groundwater Development and Water Supply Training Project which lasted for 7 years since 1998. In the EWTEC Project research function was newly added to its implementation programs based on the official request of MoWR in order to promote research and development activities in this country.

Ethiopia endows relatively higher water resources potential compared to the near by sub-sahara countries. Nevertheless Ethiopia has been stricken repeatedly by severe droughts, and the rate of water supply coverage in this country remains lowest in the entire African region. Acknowledging these facts, it is needless to say that boosting research and development activities in effectively making use of the abundant water resources is an urgent necessity for the accelerated development of this country.

Butajira – Ziway areas were chosen for the study, because the areas were one of the type localities of Rift Valley Pediment Slope with a valuable fresh water lake, Lake Ziway, at the bottom of the Rift Valley. Any hydrogeologic and hydrologic findings as the outcome of the study could be applied to adjacent as well as other rift valley areas. Some parts of the areas seem to be rich in shallow groundwater, nevertheless many people experienced severe food shortage during and after the 2002/2003 drought. The areas were easily accessible from Addis Ababa, so that any experimental facilities installed and constructed by the study are excellent live teaching materials for the various training programs of the EWTEC.

2. General Information of Study Area

The study area covers some parts of Sodo, Meskan and Mareko Woreda, Gurage Zone, SNNPR, and Ziway and Dugda Bora Woreda, East Shoa Zone, Oromia Region. The study area lies in about 30 x 60km tract of land which ranges from the high land through the Rift Valley Pediment Slope to the bottom of the Rift Valley (see attached map). Many villages in the study area significantly suffered the shortage of food caused by the 2002/2003 drought and received the emergency food aid. Many cases of children's malnutrition during and after the drought were also reported in the study area. Some statistic figures of Woreda in the study area are shown below.

Statistical Figures of the Woreda in the Study Area

Woreda	Population	Ppl received Food Aid	No. of SH	No. of DM
Sodo	138,819	13,100	2	10
Meskan	236,133	32,400	14	7
Mereko	55,060	39,400	16	8
Ziway				
Dugda Bora	163,000		8	32

SH ; Shallow Well with Hand Pump, DM ; Deep Well with Motor Pump

3. Objectives

The over all objective of the Study is to promote research and development activities of this country for the accelerated development of water sector and for the achievement of MDGs in terms of water supply coverage rate. While the specific objectives of the Study are,

- 1) To elucidate groundwater flow mechanism through the type locality of Rift Valley Pediment Slopes
- 2) To boost groundwater development and management in the study area as well as adjacent areas so as to make ready preparedness against chronic drought
- 3) To develop and disseminate various types of appropriate technologies to effectively store, lift, utilize and improve the quality of water so as to make the communities resilient against chronic drought.
- 4) To feed back the outcomes of the study to various training programs of EWTEC, and to utilize the study area as a live experimental field for the training programs.

4. Study Items

1) Baseline Study

To collect data on sociological, economic, agricultural, health and hygiene indices, common, endemic and epidemic diseases, average water consumption and daily hygienic behavior of inhabitants etc, and to analyze the data.

2) Groundwater Management

- a) Morphological Analysis
- b) Geological / Hydrogeological Field Investigation
- c) Inventory of Existing Water Point
- d) Water Quality Analysis
- e) River Discharge Observation
- f) Geophysical Exploration / Siting for Test Drilling
- g) Test Drilling of Observation Wells
- h) Groundwater Level Observation
- i) Water Balance Analysis
- j) Designing Data Base and GIS
- k) Formulation of Groundwater Model, Data Base and GIS, Hydrogeological Map, Water Resources Management Plan and Rural Water and Sanitation Development Plan

3) Appropriate Technology

- a) Inventory of Existing Technologies
- b) Identification of Suitable Appropriate Technology
- c) Designing Appropriate Technologies
- d) Construction of Appropriate Technologies
- e) Supervision of the construction
- f) Monitoring and Evaluation
- g) Formulation of Development and Dissemination Plan of Appropriate Technology

5. Required Professional Manpower

1) Baseline Study

- a) Socio-Economist
- b) Health and Hygiene Expert

2) Groundwater Management

- a) Hydrogeologist A
- b) Hydrogeologist B
- c) Groundwater Model Expert
- d) Data Base and GIS Expert
- e) Water Quality Expert
- f) Hydrologist
- g) Superintendent Driller

3) Appropriate Technology

- a) Appropriate Technology Expert A
- b) Appropriate Technology Expert B
- c) Civil Engineer

All the professionals (except for superintendent driller) must hold BSc or MSc (BA or MA for the Socio–Economist) and minimum working experience of 6 years in the relevant fields. As for Hydrogeologist A, he or she must have minimum working experience of 10 year in the relevant fields and MSc holder is preferable.

Likewise Appropriate Technology Expert A must have a minimum working experience of 10 years in the relevant fields and MSc holder is preferable.

6. Possible Available Equipment

- 1) Groundwater Investigation
 - a) GPS
 - b) Water Level Recorder
 - c) Electric Resistivity Equipment
 - d) Electro Magnetic Equipment
 - e) Piezometric Meter
 - f) Stereo Scope for Morphological Analysis
 - g) Soft Ware for Groundwater Model
 - h) Others

- 2) Test Drilling
 - a) Drilling Machine and auxiliary tools
 - b) Compressor
 - c) Supporting Vehicles

All those equipment and tools mentioned above were procured by JICA in the previous years and currently belong to the EWTEC. They will be deployed to the study whenever they are available.

All the vehicles and drivers required to execute the study other than the supporting vehicles for the test drilling should be provided by the consultants.

7. Study Schedule

The Study is divided into following three sub-studies,

- 1) Preliminary Study (Mid Apr. to End of Jun. 2005)
- 2) Actual Study (Aug. 2005 to the End of Mar. 2006)
- 3) Analytical Study (Apr. 2006 to End of Jan. 2007)

Successfully bided consultant must start the works immediately after the contract is made.

The Preliminary Study includes the Baseline Study, Morphological Study, Geological / Hydrogeological Field Investigation, Inventory of Existing Water Points, Geophysical Exploration and Designing Appropriate Technologies etc. The Actual Study includes Test Drilling of Observation Wells, Construction of Various Appropriate Technologies, Water Quality Analysis and River Discharge Observation etc. The Analytical Study includes Water Balance Analysis, Formulation of GIS, Groundwater Model and Formulation of Development and Dissemination Plan of Appropriate Technologies etc.

8. Major Outputs of the Study

- 1) Baseline Study
 - a) Report and analysis on various current sociological, economic, agricultural and health and hygienic indices, and daily behavior of the inhabitants.

- 2) Groundwater Management
 - a) Comprehensive Groundwater Model of the Area (Apply latest and sophisticated 3 dimensional simulation software such as Processing MODFLOW Pro)
 - b) Data Base and GIS (Apply latest version of Arc View software, and for base map apply free DEM provided by Maryland University)
 - c) Hydrogeologic Map(Scale of the map should be about 1:100,000)
 - d) Water Resources Development and Management Plan
 - e) Rural Water and Sanitation Development Plan

- 3) Appropriate Technology
 - a) Development and Dissemination Plan of Most Suitable Appropriate Technologies

9. Implementation Method

1) Man Power

We will hire all the required professionals listed above from local consultants to implement the study. Average duration of assignment of each professional will be about 3 months, and the total assignment of the professionals to implement the study will be about 36 Man / Month. Successfully bided consultant is required to submit actual assignment schedule of respective professional before the contract is made. Supervision of the study will be carried out by Japanese experts and Ethiopian staffs of EWTEC in the relevant fields. Any involvements of MoWR or Regional Water Bureau staffs in the study are always welcome. We will collaborate with JICA Agricultural Extension Project and Sasagawa Africa Foundation in the fields of crop identification and development, agricultural extension or improvement of health and hygiene condition which are actually out of the scope of the study.

2) Test Drilling of Observation Well

The drilling plan which includes exact location of the respective observation well with estimated depth should be formulated as a result of the preliminary study by the consultant. There are two types of drilling works, e.g. a) shallower (up to 150m in depth) drilling in NW of Koshe and near Ziway, b) Deeper drilling works (200 to 250m in depth) in between Koshe and Ziway. We will deploy our machine and man power to the shallower drilling works, if necessary we will hire a superintendent driller to supervise the works. Drilling practice programs of the Drilling Technology Training Course will be carried out in the study area while our own machine and man power are deployed in there.

Deeper drilling works will be outsourced to the local contractor(s). Supervising works of the outsourced drilling will be carried out by the consultants. We are expecting about 6 – 7 shallower wells and 2-3 deeper test wells. However the detailed drilling programs will be fixed later after the preliminary study.

3) Construction of various appropriate technologies

Similarly the construction works of the various appropriate technologies and installation of them in the study area will be outsourced to the local contractors or teams of local artisans. Supervising works will be carried out by the consultant who implement the study.

4) Preparation of a room for the study in EWTEC and appointment of a Liaison

We need to secure a room in EWTEC for the study during the study period in order to keep data files, maps and other study materials and to have periodic meeting with consultants. We also need to appoint a liaison who works for the study as a professional, e.g. Hydrogeologist A or B. The liaison will coordinate between the team of consultants and Japanese experts and / or EWTEC staffs. The liaison must come to the study room in EWTEC at least once a week, and report to the Japanese experts about the progress and forthcoming work plan of the study.

5) Reports

The consultants who implement the study are required to submit following reports by the designated time.

- a) Inception Report (two weeks after the contract is made)
- b) Progress Report 1 (at the end of Preliminary Study)
- c) Interim Report (at the end of Actual Study)
- d) Progress Report 2 (end of Aug. 2006)
- e) Draft Final Report (at the end of Analytical Study)
- f) Final Report (end of Mar. 2007)