Workshop III—Soil Salinity and Fertility
Haramaya University
, Ethiopia

REPORT "*WATERMAN*" WORKSHOP 3

September 19. – 21. 2007, Haramaya
Haramaya University

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Coordinator: Dr. Willibald Loiskandl, Universität für Bodenkultur Wien, Austria

Project Website: http://waterman.boku.ac.at

1. Workshop Day 1

1.1 Registration

Chairman: Dr. Desalegn C
Rapporteur: Dr. Melese T

1.2 Introduction

Chairman: Dr.Tena
Rapporteur: Dr. Dessalegn

1.2.1 Welcome note by **Dr. Tena Alamirew**

Dr. Tena gave a warm welcome to all participants and gave important explanations regarding the schedule and planned activities of the workshop. Furthermore he mentioned that soil salinity became a nationwide problem and emphasized the importance of this event.

1.2.2 Opening speech by **Dr. Belaineh L.**

Ladies and Gentlemen,

It is indeed a great pleasure and privilege to me to be with you here today in this 'Third International Workshop on Water Management' and deliver this introductory and opening remarks.

Dear Participants, first and the foremost, on behalf of the Haramaya University community, I welcome you all to our esteemed university. Moreover, I would like to express my appreciation and gratitude to all project partners – International Water Management Institute (IWMI), Ethiopia; University of Natural Resources and Applied Life Sciences (BOKU), Austria; Cranfield University (CU), United Kingdom; Czech University of Agriculture, Prague (CUAP); Mekelle University (MU), Ethiopia; Hawassa University (HU), Ethiopia; Ethiopian Institute of Agricultural Research (EIAR), Ethiopia; PELUM, Uganda, and Eggerton University, Kenya

Dr. Belaineh L. also points out that Ethiopia is blessed with plenty of water, but still irrigation is needed, which causes lots of problems such as salinity and sodicity and therefore it is a main university task to assist stakeholders with technologies to avoid adverse impacts. Additionally farmers are more and more facing the problem that the land is less and less responding to fertilizers, which is most probably caused by acidity of the soil.
Finally Dr. Belaineh officially opens the workshop.

1.2.3 Keynote speech by **Dr. Fantahun Abegaz**

Food production, predominantly under rain fed conditions, in water scarce region could not cope with the population growth. The current strong interest in water harvesting and utilization of the harvested water and water from streams, rivers, groundwater's and lakes for irrigation in Ethiopia arises from the growing incapacity of the country to feed its population depending on the unpredictable rainfall. In accordance with many countries in the world, irrigation through intensification and stabilization of production has appeared to offer a good solution for food insecurity and modernization of production has appeared to offer a good solution for food insecurity and modernization of agriculture in the country. Nonetheless, introduction of irrigation, be it at large or small scale, will definitely have problems associated with land

degradation either by causing salinity/sodality or aggravating the situation by rising water table due to poor drainage or use of low quality irrigation water.

Basically, and agricultural activity upsets the natural ecosystem. The conflict between agriculture and environmental protection is a challenge to mankind for survival. There is no doubt that all societies regardless of the stage of industrialization and political maturity, have to depend on agriculture at least for food supply. On the other hand, exploitative agricultural practices usually cause rampant environmental damage and natural resource degradation. In this regard, effort has to be made to protect our natural resources and make sure that optimum utilization of same is made to secure the existence and well-being of the present and future generations.

The problem of soil degradation is a serious threat to the welfare of mankind. Although degradation of the land has always characterized man's systematic use of it, the process has accelerated in reconnect decades and precisely at a time when population growth and rising expectations have begun to demand enormous increases in food production. The problem is of overwhelming urgency because as the soil is subject to degradation, the cost of reclaiming it becomes higher, rising sharply until the threshold level reaches a stage beyond which reclamation is no longer economically feasible.

Soil salinity and/or sodality (salt affected soils) are among the major land degradation problems worldwide as well as in Ethiopia. The development of salt affected soils and associated problems are most pronounced in arid and semi arid regions of the earth which offer considerable promise for development as major food producing regions, because of their frequent potential for multiple cropping. Irrigation, evaporation of moisture from the surface or shallow depths within the profile, and the insufficient annual rainfall to leach down salts from the plant rooting zone favor excessive accumulation of soluble salts in soils of arid and semi arid regions are rendering such lands to have been used by human beings with only marginal success since the advent of agriculture. As a result, the study of arid lands and salt affected soils has been important throughout the history of agricultural development.

Partial or complete loss of soil productivity attributed to accumulation of excess salts in the root zone of soils in the arid and semi arid climates is a worldwide phenomenon. However, the most serious salinity and solidity problems are being faced in the irrigated arid and semi arid regions of the world and it is in these regions that irrigation is essential to increase agricultural production to satisfy food requirements. Soil salinity is also a serious problem in areas where groundwater of high salt content is used for irrigation. On the other hand, irrigation is often costly, technically complex and requires skilled management. Failure to apply efficient principles of water management may result in wastage of water through seepage; over-watering and inadequate drainage resulting in water – logging and salinity/sodicity problems which reduce the soil productivity, eventually leading to loss of cultivable land. Thus, development of technology to control and mitigate salinity and sodicity is particularly an important issue for modern agricultural management and for countries such as Ethiopia where arid and semi arid climatic zones occupy over 60% of the total land area.

Generally, the main sources of salinity are shallow ground water tables, natural saline seeps irrigation waters, source from marine origin and fertilization. The world's total land area under salt affected soils at the present time is estimated at over 950 million ha, approximately. Approximately 40 or 50% of the irrigated land in the arid and semi arid regions in the world has some degree of soil salinity and/or sodicity problems. Moreover, an estimated land area of

405 million has in the world is with saline aquifers. As a result, over 6 million ha of the lands of our planet are estimated to be lost each year to salinity, sodicity and drainage problems.

In Ethiopia, approximately 11 million ha are salt affected soils. These are mainly concentrated in the Rift Valley, Wabi Shebelle River Basin and various other lowlands and valley bottoms. For instance, it has been reported that of the 4,000 hectares of irrigated lands at Melka Sedi, about 40.0 16.98 and 0.02% were saline, saline sodic and sodic, respectively. Similar reports also indicate that a considerable area of land has been abandoned for cultivation due to the prevalence of salt affected soils at the Middle Awash. Furthermore, recent reports also indicate that 39% of the Abaya State Farm is salt affected. These figures indicate the magnitude of the problem that must be tackled in order to meet future national food needs of the increasing population which is generally agreed to be met by directing the efforts of all concerned towards improving the level of management of soils already under cultivation, and by bringing new areas, in practice new areas of the dry land ecosystems, under cultivation.

The excess soluble salts and exchangeable sodium (Na) of saline and sodic soils reduce plant growth and vigor by altering water uptake and soil physical properties negatively, and by causing ion- specific toxicities or imbalances. Establishing good drainage is generally the cure for these problems. However, salinity and sodality problems are often more complex. Proper soil- water crop management procedures, combined with periodic soil tests, are needed to prolong the productivity of salt affected soils. Employing wise management for both short- and long- term utilization of these lands is thus of paramount importance. The research programs in dry land ecosystems must address five main themes

(a) indigenous systems with a focus on the human dimension,
(b) methods for appraisal of water harvesting
(c) optimization of the use of harvested water,
(d) prevention, management, and reclamation of salt affected soils, and
(e) dissemination of new technologic to land users.

The problems of salt affected soils are old but their magnitude and intensity have been increasing fast due to the establishment of large- scale irrigated farms in recent decades. Inadequate provision of drainage system, poor water management practices coupled with unsound reclamation procedures have hade the problem worse. In general, 2,280 ha (Melka sadi), 500 ha (Metehara), 300 ha (Asayta), 220 ha (Kebena or Yalo), 145 ha (Kesem), 100 ha (Gewanie), 56 ha (Werer State Farm), 80 ha (Shoa, Kefa Dura), 20 ha (Millie) and some areas at Tangay Kuma State Farm have proved to be salt affected. Moreover, it is expected that the salt affected soils in these areas will dramatically increase in the coming few years if the current irrigation practice is allowed to continue.

Development of large irrigation schemes, at the lower, middle and Upper Awash Valleys, without appropriate drainage system and water management practices has led to gradual rise of saline groundwater. Furthermore, development of shallow saline groundwater with high evapotranspiration (ET) has contributed to secondary Stalinization and alkalization. Generally, a combination of two or more of exposure of subsoil salts through land leveling, saline and/or sodic near surface or rising groundwater, intense and often inefficient irrigation practices along with inadequate drainage systems, low- lying topography and the resultant arid climate or insufficient annual rainfall to leach accumulated salts from the plant root zone, and in some areas the use of pr quality irrigation waters are suggested to be responsible for the solemnization and alkalization of the salt affected soils in Ethiopia particularly those of the Awash River Basin.

1.3 Workshop Schedule

2 days workshop + 1day field trip

September 19th 2007: Opening, keynote speeches, presentations and group discussions.

September 20th 2007: Presentations,
Summaries of the results of the group discussions,
Presentation and demonstration of biofertilizer and mushroom production methods

September 21st 2007: Field trip (Metahara Sugar Plantation)

1.4 Presentation – Morning Session

Chairmen: Dr. Melese
Rapporteur: Dr. Desalegn C

Presentation 1:

Prognosis and Diagnosis of Soil Salinisation Problem in the Middle Awash

Presenter: Tena Alamirew

Key Words:

- Irrigation induced salinisation
- Secondary salinity
- Critical water table depth

Content:

- Groundwater induced salinity buildup has been monitored on commercial irrigated farms in Ethiopia
- Secondary salinisation caused by capillary rise from shallow water table
- After installation of the subsurface drains, the rate of water table rise declined

Discussion of Presentation and previous speeches:

- Dissemination topic is raised
- Poor Water Management is a said to be a main cause for salinity

Presentation 2:

In situ determination of soil hydro-physical properties important for water and salt movement in soils - saturated hydraulic conductivity and sorptivity

Presenter: Svatopluk Matula

Keywords:

- Infiltration
- Pressure infiltrometer
- Mariotte bottle
- Soil hydrophysical properties
- Saturated hydraulic conductivity
- Sorptivity

Content:

- The design and application of a simple pressure infiltrometer is presented
- The only principle employed is mechanic-hydraulic, the source of energy is not needed
- The device is portable, simple to maintain a can be operated by one technician
- The results showed that the infiltrometer is a good simple tool for the soil hydrophysical properties measurements

Discussion:

- Theoretical and practical details of the pressure infiltrometer are discussed.

Presentation 3:

Characterization and classification of salt affected soils and irrigation waters in the irrigated areas of Bisidimo, East Hararghe zone of Oromia region, Ethiopia

Presenter: Gizaw Berihanu

Key Words:

- Soil Properties
- Quality of irrigation water
- Soil salinity and sodicity

Content:

- Classification of soils of irrigated areas to the standard classes of salt affected soils
- Assessment of the chemical properties
- Evaluation of the irrigation water the in the area in different seasons
- Major source of soil salinity and sodicity in the Errer Valley areas were irrigation waters from ground water as well as the Errer River itself

1.5 Morning Group Discussions

To discuss on several topics, 3 Groups were formed which were led by Dr. Tena, Prof. Matula and Prof. Schneider.

Salinisation

Topics:

- How Egypt managed to escape problem of salinity
- The role & concept of groundwater
- Subsurface drainage
- Small scale irrigators' salinisation problems
- Water research in the country
- Stakeholder's interests in the topic

Instrumentation

Topics:

- Determination of soil hydrophysical processes in situ
- Differences between the technologies of the measurement
- General and local experience
- Application of the pressure infiltrometer, presented at the workshop
- The modification of the Guelph permeameter as a pressure infiltrometer
- General recommendations for the practical field application of the experimental instrumentation in the research in Ethiopia

Political Issues, dissemination of knowledge

Topics:

- How to disseminate knowledge to the end users
- Communication between all stakeholders – researchers, policy makers, and farmers
- Research should be more farmer-oriented
- Watershed management and also small scale management should be connected
- Governmental programs
- Possible solutions

1.6 Presentation – Afternoon Session

Chairman: Prof. Schneider
Rapporteur: Dr. Nata

Presentation 4:

Use of organic manure to increase soil fertility and productivity in Uganda. A case study from small - scale farmers in Mukono District - Uganda

Presenter: Joseph Mulindwa

Keywords:

- Organic Manure Productivity
- Yield
- Farmer Participatory Research

Content:

- Soil fertility decline is one of the major constraints to food security
- The farmers have been using inorganic fertilizers for a long time
- The constraints are the high costs, spoiling of soil structure, the continuous need, health and environmental associated problems
- Alternative to use organic manure and can easily made using locally available organic materials.
- Farmer Participatory Research has been conducted with farmer group in Mukono under "Farmer to Market" project
- The aim was to evaluate the effect of three different soil treatments using organic materials on bean yield performance.
- The technology has been tested and adopted by farmers which is increasingly improving soil fertility and productivity at household levels

Discussion:

- Problems with chemical fertilizers such as
  - misuse and high costs
- Costs are mentioned as pros of organic option

Presentation 5:

An overview of acid soils and their management in Ethiopia

Presenter: Taye Bekele

Key Words:

- Soil Acidity
- Liming

Content:

- Soil acidity is one of the major production-limiting factors in Ethiopia
- Excessive leaching of basic cations
- Building the fertility of soils through integrated management of nutrient inputs combined with liming

Discussion:

- Use of lime is discussed
- This topic is recognized as a good example of how simple and effective engineers can assist farmers with their knowledge

Chairman: Prof. Taffa
Rapporteur: Mohammed A

Presentation 6:

Evaluation of Irrigation Water Quality in Ethiopia Sugarcane Plantations: Metehara Sugar Estate

Presenter: Girma Abejehu

Key Words:

- Salinity
- Sodicity
- Specific ion toxicity

Content:

- At Metahara sugar estate in Ethiopia quality of irrigation water, drainage water, ground water, and Lake Beseka water were tested
- Sampling was executed four times a year, i.e., in January , April, July, and October assuming that each month represents different seasons
- The samples were analyzed for different water quality parameters following standard analytical procedures
- The results of ground water and Lake Beseka water were in agreement with the prevailing field conditions
- Suggestions were forwarded to limit upward movement of ground water (which is saline-sodic) through proper management of field water application practices and to avoid further expansion of Lake Beseka water (also saline-sodic) towards sugarcane fields

Discussion

- Why the specific methods have been chosen

Presentation 7:

Suitability test of Awash River water quality for irrigation

Presenter: Fentaw Abegaz

Key Words:

- Water Management
- Salinisation

Content:

- Basic effects of poor water management such as increased salt concentrations, rising water tables and subsequent salinisation, water logging, and leaching of essential plant nutrients
- Awash River water quality and its suitability for irrigation purposes
- In most of the down stream sampling sites, the Awash River is slight to moderate restricted to use for irrigation from soil infiltration, osmotic and toxicity point of view

Discussion:

- The problem of the expanding Lake Beseka (bordering Metehara Sugarcane Factory) is discussed
- Draining Lake Beseka to Awash River by 2% of river flow is questioned as solution

1.7 Afternoon Group Discussions

3 Groups were formed in order to deal with the following topics:

1) **How to integrate/link indigenous knowledge and how to deal with gender issues & ethnic tensions**

2) **Possible ways of dissemination & awareness building**

3) **Possible constraints of 1) and ways of dissemination**

2. Workshop Day 2

2.1 Presentation – Morning Session

Chairman: Prof. Matula
Rapporteur: Dr. Kibebew

Presentation 8: **The WaSim Software: Characteristics and Advantages. Presentation to the Ethiopian Key Stakeholders.** Presenter: Carlos Lorenzo	
Key Words: - Water Balance Model - Teaching and demonstration **Content:** - WaSim is a computer-based Water Balance Model - It is specially designed for those involved in the management of irrigation, drainage and salinity issues - Wide range of different management strategies and scenarios can be simulated - Recently a new tutorial manual with an Ethiopian WaSim example has been developed **Discussion:** - Immediate insight in basic processes happening in the soil - Teaching nature of this program is underlined - Validity for Ethiopian conditions is confirmed	
Presentation 9: **Extent of Salinity and Sodicity on Hand Dug Wells Command Area in Debrekidan, Northern Ethiopia** Presenter: Dr. Nata Tadesse	
Key Words:	

- Irrigation
- Hand dug well
- Salinity
- Sodicity
- Soil

Content:

- Extent of salinity and sodicity on hand dug wells command area in Debrekidan, Northern Ethiopia
- Soil samples during rainy and irrigation periods were collected and EC and pH values were analyzed
- The soil of the command area of hand-dug wells is free of salinity and sodicity problems

Discussion:

- The uncertainty of whether shallow wells are a sustainable solution or not is dealt with
- Local farmers are interrogated on the problem.

Chairman: Dr. Fentaw
Rapporteur: Dr. Kibebew

Presentation 11:

Soil Salinisation and Sodicification-a serious treat to sustainable crop production in Middle Awash

Presenter: Abere Minalku & Melese Mengesha

Key Words:

- Soil fertility
- Deficient Minerals
- Groundwater level

Content:

- Anthropogenic and natural causes of salinity degraded potentially good soils
- Summaries of researches conducted in WARC in relation to soil salinity and fertility issues in Middle Awash
- Ground water level rose from 10 m to 1-2m below surface
- Soil salinity and sodicity are the number one soil related yield limiting problem of the area
- Full fledged natural resource survey, land evaluation and crop suitability studies have been performed before cultivation
- Any irrigation project should follow a conservation based approach

Discussion:

- The (counterproductive) method of trying to wash away the salt from the fields is mentioned.
- Dealing with this topic again the importance of basic knowledge transfer to the farmers is emphasized

2.2 Presentation of Results of the Group Discussions

2.2.1 Presentation of the Results of the Morning Group Discussions

Group 1:

Topic: **Salinisation** *Chairman: Dr. Tena*

Issues for discussion:

- How Egypt managed to escape problem of salinity
- Can Prosopis *julifora* be used for bio- salinity control?
- The role of groundwater
- The concept of groundwater
- Is subsurface drainage a recommendable solution
- Mapping of salt affected soils at national level
- Small scale irrigators' salinisation problems has not been given enough attention
- Water research in the country not been given enough attention
- Stakeholders are not interested in salinity – they just simply want more water

Group 2:

Topic: **Instrumentation** *Chairman: Prof. Matula*

The main issue: Determination of soil hydrophysical processes in situ

- The explanation of differences between the technologies of the measurement
- The general and local experience of using the instrumentation in Ethiopia (which devices are used here in the research and university practice
- Application of the pressure infiltometer, presented at the Workshop the offer to disseminate the experience, design included details and help in construction
- The modification of the Guelph permeameter as a pressure infiltrometer – design of the extension of use as the pressure infiltrometer (it is saving the investment and enlarging the used of the device already available here)
- How to describe the dynamic process of infiltration tests to get unsaturated hydraulic conductivity from the measurement in situ. Measurement of several points of the k(h) relationship curve
- General recommendations for the practical field application of the experimental instrumentation in the research in Ethiopia

Group 3:

Topic: **Political Issues, dissemination of knowledge** *Chairman: Prof. Schneider*
Rapporteur: Kamila Spongrová

Introductory words:
Scientists and engineers know what the problem is and also how to solve it; the main question is: HOW TO DISSEMINATE THE KNOWLEDGE TO THE FINAL USER (FARMERS, …)

Discussion: - what needs to be done?
- what are the related problems?

IMPORTANT POINTS:

- **Communication**
  Communication needs to be established between all stakeholders – researchers, policy makers, and farmers
- **For farmers**
  The scientific results are presented in too complicated form; also the language used is a problem
  Not enough information reaches the farmers
  Research should be more farmer and demand-oriented
- **Management**
  Watershed management and also small scale management should be connected to regulate the upstream and downstream water resources conflicts
- **Governmental programs**
  Programs exist, also dissemination issue is largely discussed, but it does not work well.

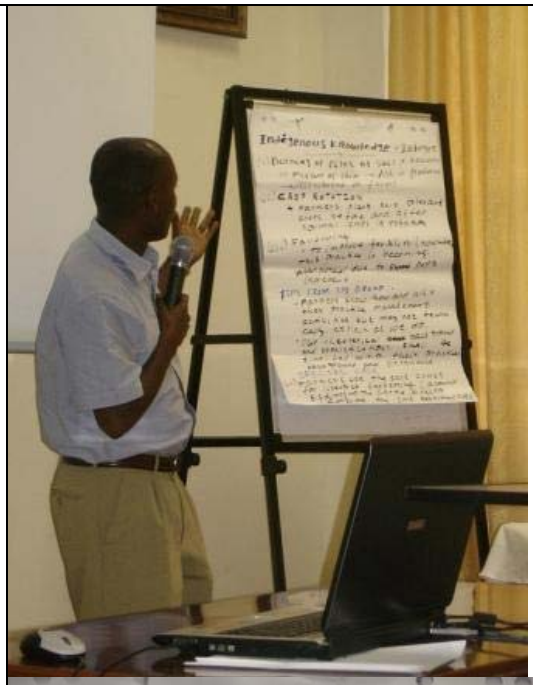
WHAT NEEDS TO BE DONE:

- To simplify the research results to an understandable form (also in local languages versions, include demonstration…)
- To present a simple and low cost technology
- To respect the local farmers and their knowledge
- To build up a connection and start to communicate

2.2.2 Presentation of the Results of the Afternoon Group Discussions

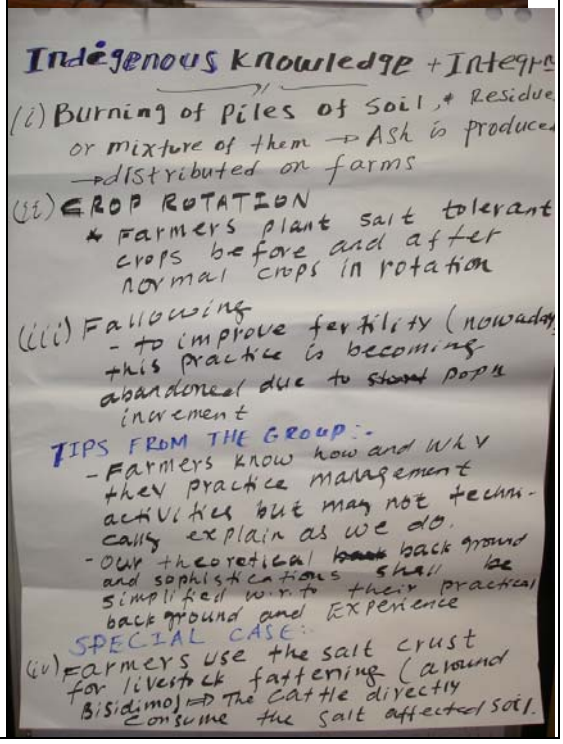
1) How to integrate/ link indigenous knowledge and how to deal with gender issues & ethnic tensions?

- Burning of piles of soil, residues or mixture of them -> Ash is produced -> distribution on farms
- Crop rotation: farmers plant salt tolerant crops before and after normal crops in rotation
- Fallowing: to improve fertility
  Nowadays this practice is becoming abandoned due to population growth.



Tips from the group:

- Farmers know how and why they practice management activities but may not technically explain as we do
- Our theoretical background and sophistications shall be simplified with regard to their practical background and experience



Special case:

Farmers use the salt crust for livestock fattening (around Bisidimo) -> the cattle directly consumes the salt affected soil

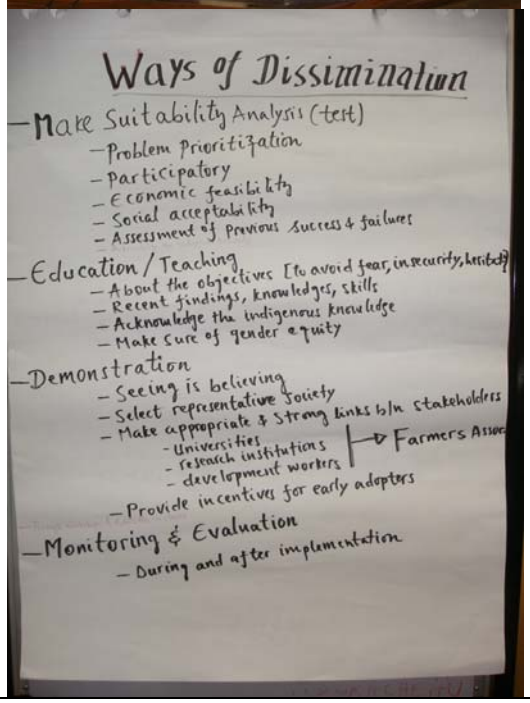
2) Possible ways of dissemination & awareness building.

- Make suitability Analysis (test)
  - Problem prioritization
  - Participatory
  - Economic feasibility
  - Social acceptability
  - Assessment of previous success & failures

- Education/Teaching
  - About the objectives (to avoid fear, insecurity, hesitance)
  - Recent findings, knowledge, skills
  - Acknowledge the indigenous knowledge
  - Make sure of gender equity

- Demonstration
  - Seeing is believing
  - Select representative society
  - Make appropriate and strong links between stakeholders:
    - universities
    - research institutions
    - development workers
    - farmers associations
  - provide incentives for early adopters

- Monitoring & Evaluation
  - During and after implementation



3) Possible constraints of topic 1 and ways of dissemination.

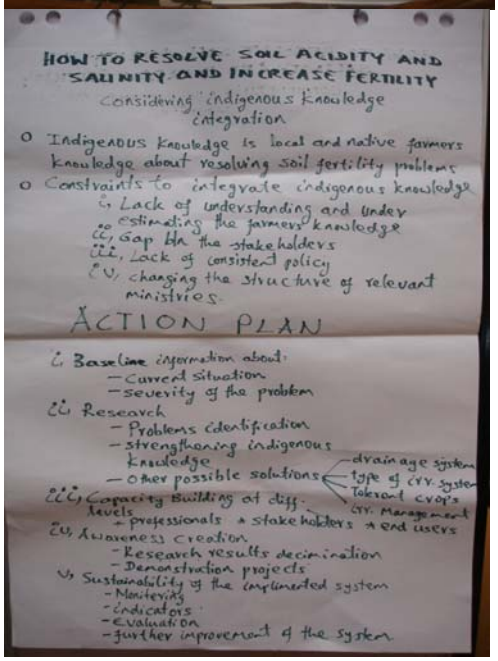
Indigenous knowledge is local and native. Farmers know about resolving soil fertility problems.

Constraints:

- Lack of understanding and underestimating the farmers' knowledge
- Gap between stakeholders
- Lack of consistent policy
- Changing structure of relevant ministries

Action plan:

- Baseline information about:
  - current situation
  - severity of the problem
- Research
  - Problem identification
  - Strengthening indigenous knowledge
  - Other possible solutions: drainage system, type of irrigation system, tolerant crops, irrigation management
- Capacity Building at different levels
  - Professionals
  - Stakeholders
  - End users
- Awareness creation
  - Research results dissemination
  - Demonstration projects
- Sustainability of the implemented system
  - Monitoring
  - Indicators
  - Evaluation
  - Further improvement of the system



2.3 Presentation - Afternoon Session

Presentation 12:

Biofertilizers in soil fertility management: the experience of Haramaya University

Presenter: Prof. Pant

Key Words:

Content:

- **Farmer friendly method of fast biofertilizer production**

Discussion:

- **Improved organic- fertilizer production method is explained to the farmers in detail:**

What you need:

- Organic Waste
- Straw
- Earthworms

Method:

- Collect earthworms by distributing formalin- solution on ground with earthworm holes
- Dig a Pit (~ 1x10m), attach plastic folia
- Fill the pit layer wise with waste and straw, after 2nd layer add ~ 1000 earthworms/m^2
- Add more layers (up to a height of one meter)
- Add water, cover the heap with clothes
- Wait for 1,5 month
  -> Digested waste becomes biofertilizer

Advantages:

- Easy
- Fast
- Sustainable

2.4 Demonstration of Mushroom & Biofertilizer Production

Haramaya University works on introducing mushroom production to Ethiopia, e. g. by distributing mushroom spores to farmers. **Experiments with different substrates such as wheat, coffee and maize leftovers are performed.**	
Biofertilizer Production Site.	
Prof. Pant demonstrates the biofertilizer production method to farmers. **A simple and sustainable option to improve soil fertility.**	

2.5 Evening Tour to 1000 year old Town Harar

3. Workshop Day 3: Fieldtrip

3.1 Metehara Sugarcane Factory

On the way to Addis Ababa, in the Rift Valley, Metahara Sugarcane Factory is located. It is of scientific interest because of several reasons: Apart from being an interesting site for its dimension and used production technology, it is facing severe salinity problems. Probably most remarkable is the factory's problem with the nearby expanding Lake Beseka, due to which every year several hectares of cultivated plots have to be left abandoned.

Sugarcane field already bordering Lake Beseka. **The reason for its expansion is not clear yet. Most probably the water table rises due to geological movements of the Lake bottom or due to springs which are found in the lake**	
Several attempts were made to keep the water away. **Flood protection dikes were built.** **The lake is also drained into Awash River. But there is a restriction concerning the amount with which the lake is drained into the river because of the high concentration of salt and other toxic minerals.** **Currently only about 2% of the river flow rate is being added (see presentation 7).**	
Obvious salinity problems, mainly caused by the rising of the ground water table.	

Lately abandoned field (some sugarcane crops left in the background). **Probably the problem could be diminished by improved irrigation management.**	
Currently affected fields can only manually be worked on.	

4. Evaluation of the Workshop

4.1 Topics covered

- Role of woman in rural families
- Little scientific knowledge of farmers - lack of dissemination and knowledge sharing
- Underestimation of indigenous knowledge by researchers
- Which solutions to current problems can be found in indigenous knowledge
- Problems associated with the expanding Lake Beseka
- Practical dealing with soil salinity and salt crust by farmers
- Ways of dissemination of research results to farmers and other stakeholders
- How can knowledge and technologies be simplified to make them applicable
- Whether shallow wells are a sustainable solution
- Advantages of biological fertilizers
- Whether drainage is a sustainable and cost effective solution
- Introduction of mushroom production to Ethiopian farmers
- Improvement of the farmers' livelihoods by introducing Biofertilizer and mushroom production

4.1 Conclusion

(+) Pros	(-) Cons
• Contact between university and farmers was established (no contact before the workshop) • International exchange of country- specific experience • Awareness was raised regarding the demands of users (farmers) • University staff got to know the problems of the nearby farmers • 2 easy and sustainable methods were presented and demonstrated which could increase the income of the farmers • Ways of dissemination were highlighted	• Women participation needs to be increased • Communication problem with farmers • Little willingness of participants to deal with "hot topics" (ethnic, gender issues) • Policy makers could not be motivated to attend the workshop • Workshop setup should focus rather on group discussions and demonstrations than on oral presentations

5. Annex

5.1 Time Table

Day 1: September 19, 2007 (Morning Session)		
Time	**Description**	**Chairperson (Facilitator)/ Rapporteur**
8:30 – 9:00	**Registration**	Desalegn C/Melese T
9:00 - 9:15	**Welcome Address**	Dr. Tena A.
9:15 - 9:30	**Opening Speech**	Dr. Belaineh L
9:15 - 9:30	**Keynote speech**	Dr. Fantahun
9:30-:9:45	**Introduction of participants**	
9:45 -10:05	**Presentation 1:** Prognosis and Diagnosis of Soil Salinisation Problem in the Middle Awash Presenter: Tena Alamirew	Dr. Tilahun H Dr. Desalegn C
10:05 - 10:25	**Discussion**	
10:25 - 10:55	**Health Break**	
10:55 - 11:15	**Presentation 2:** In situ determination of soil hydro-physical properties important for water and salt movement in soils - saturated hydraulic conductivity and sorptivity Presenter: Svatopluk Matula	Dr. Abreham W/M Dr. Dessalegn C
11:15 - 11:35	**Discussion**	
11:35 - 11:55	**Presentation 3:** Characterization and classification of salt affected soils and irrigation waters in the irrigated areas of Bisidimo, East Hararghe zone of Oromia region, Ethiopia Presenter: Gizaw Berihanu	Dr. Abreham W/M Dr. Dessalegn C
11:55 - 12:15	**Discussion**	
11:15 - 2:00	**Lunch**	
Day 1: September 19, 2007 (Afternoon Session)		
Time	**Description**	**Chairperson (Facilitator)/ Rapporteur**
2:00 - 2:20	**Presentation 4:** Use of organic manure to increase soil fertility and productivity in Uganda. A case study from small - scale farmers in Mukono District - Uganda Presenter: Joseph Mulindwa	Prof. Schneider Dr. Nata
2:20 - 2:40	**Discussion**	

2:40 - 3:00	**Presentation 5:** An overview of Acid soils and their management in Ethiopia Presenter: Taye Bekele	Prof. Schneider Dr. Nata
3:00 - 3:20	**Discussion**	
3:20– 3:50	**Health Break**	
3:50 - 4:10	**Presentation 6:** Evaluation of Irrigation Water Quality in Ethiopia Sugarcane Plantations: I. Metehara Sugar Estate. Presenter: Girma Abejew	Prof. Taffa Fiseha G
4:10 - 4:30	Discussion	
4:30 - 4:50	**Presentation 7:** Suitability Test of Awash River Water quality for Iriigation Presenter: Fentaw Abegaz	Prof. Taffa Fiseha G
4:50 - 5:10	**Discussion**	
Day 2: September 20, 2007 (Morning Session)		
Time	**Description**	**Chairperson (Facilitator)/ Rapporteur**
9:00 – 9:25	**Presentation 8:** Extent of Salinity and Sodicity on Hand Dug Wells Command Area in Debrekidan, Northern Ethiopia. Presenter: Dr Nata T	Prof. Matula Dr. Kibebew
9:25 - 9:50	**Discussion**	
9:50 - 10:15	**Presentation 9:** The WaSim Software: Characteristics and Advantages. Presentation to the Ethiopian Key Stakeholders. Presenter: Carlos Lorenzo	Prof. Matula Dr. Kibebew
10:15 - 10:40	**Discussion**	
10:40-:11:10	**Health Break**	
11:10 -11:35	**Presentation 10:** Middle Awash experiences Presenter:	Dr. Fantahun
11:35 - 12:00	**Discussion**	
12:00 - 2:00	**Lunch**	
Day 2: September 20, 2007 (Afternoon Session)		
Time	**Description**	**Chairperson (Facilitator)/ Rapporteur**
2:00 – 3:00	**Presentation 11:** Biofertilizers in soil fertility management: the experience of Haramaya University Presenter: Prof. Pant	Dr. Bobe
3:00 - 3:30	**Health Break**	
3:30 - 6:00	***Tour To 1000 Years Old Town***	

Day 3: September 21, 2007 Field Excursion		
Time	**Description**	**Remark**
6:00	Departure to Middle Awash	
9:00 - 9:45	Breakfast in Chiro	
11:00 - 12:00	Arrival/Middle Awash	
12:00 - 1:00	Lunch at Metehara SF or Awash	Tentative
2:00 - 4:00	**Metehara Sugar Factory**	
According to the final tour	Nazareth/Addis Ababa	Tentative

5.2 List of Participants

	Name	Institution
1	Jean Schneider	BOKU, Austria
2	Helmut Schabschneider	BOKU, Austria
3	Klaus Sattler	BOKU, Austria
4	Dominik Ruffeis	BOKU, Austria
5	Kamila Spongrova	CUAP, (new name CULSP), Czech Republic
6	Svatopluk Matula	CUAP, (new name CULSP), Czech Republic
7	Carlos Lorenzo	Cranfield University, UK
8	Joseph Mulindwa	PELUM, Uganda
9	Benedict M. Mutua	Eggerton University, Kenya
10	Dessie Nadew	Mekelle University, Ethiopia
11	Nata Tadesse	Mekelle University, Ethiopia
12	Mesay Daniel	Mekelle University, Ethiopia
13	Michael Menkir	IWMI
14	Taye Bekele	NSL, Ethiopia
15	Tilahun Hordofa	EIAR, Ethiopia
16	Fantahun Abegaz	EIAR, Ethiopia
17	Hailu Regassa	EIAR, Ethiopia
18	Abere Minalku	
19	Alemayehu Muluneh	Hawassa University, Ethiopia
20	Fitsum Tesfaye	Hawassa University, Ethiopia
21	Mulugeta Dadi	Hawassa University, Ethiopia
22	Rahamato Anito	SDA, Wonji, Ethiopia
23	Girma Abejew	SDA, Wonji, Ethiopia
24	Firew Abebe	Awash Drainage Basin In., Ethiopia
25	Kindie Tesfaye	Haramaya University, Ethiopia
26	Dessalegn Chemeda	Haramaya University, Ethiopia
27	Taffa Tulu	Haramaya University, Ethiopia

28	Melese Tesfaye	Haramaya University, Ethiopia
29	Tena Alamirew	Haramaya University, Ethiopia
30	Bobe Bedada	Haramaya University, Ethiopia
31	Kibebew Kibret	Haramaya University, Ethiopia
32	L.M. Pant	Haramaya University, Ethiopia
33	Mengistu Balew	Haramaya University, Ethiopia
34	Megersa Olumana	Haramaya University, Ethiopia
35	Shoab Quaraishi	Haramaya University, Ethiopia
36	Solomon Abera	Haramaya University, Ethiopia
37	Belaineh Legesse	Haramaya University, Ethiopia
38	Gizaw Berihanu	Haramaya University, Ethiopia
39	Berhanu Ayalew	Haramaya University, Ethiopia
40	Arega Mulu	Haramaya University, Ethiopia
41	Edao Hassen	Haramaya University, Ethiopia
42	Dereje Seyoum	Haramaya University, Ethiopia
43	Tadesse Fufa	Haramaya University, Ethiopia
44	Elias Jemal	Haramaya University, Ethiopia
45	Edo Beressa	Haramaya University, Ethiopia
46	Temesgen Kebede	Haramaya University, Ethiopia
47	Boja Mekonnen	Haramaya University, Ethiopia
48	Gashaw Tilahun	Haramaya University, Ethiopia
49	Tigst G/michael	Haramaya University, Ethiopia
50	Takele Gadissa	Haramaya University, Ethiopia
51	Tadele Tefera	Haramaya University, Ethiopia
52	Sead Ahmed	Haramaya University, Ethiopia
53	Ahmed Yusuf Ali	Farmer, Ethiopia
54	Jemal Mumed Sali	Farmer, Ethiopia
55	Abdulamid Amko	Farmer, Ethiopia
56	Abdusamad Yuye	Farmer, Ethiopia
57	Abas Dawud	Farmer, Ethiopia
58	Mustefa Sali	Farmer, Ethiopia
59	Abdi Ahmed Hassen	Farmer, Ethiopia
60	Zeka Muktar Ali	Farmer, Ethiopia