



# **Ethiopia Stakeholders' Workshop: Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity**

**Organized in Celebration of the 2015 International Year of Soils**



*Credit: courtesy of GIZ-SLM Ethiopia*

**5 and 6 November 2015  
Addis Ababa, Ethiopia**

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Ethiopian Agricultural Transformation Agency**



Agricultural Knowledge, Learning, Documentation  
and Policy Project (AKLDP-Ethiopia)

## Acknowledgments

The Ethiopia Stakeholders' Workshop: Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity was held on 5 and 6 November 2015, at the Hilton Hotel, Addis Ababa. The workshop was organized as part of Ethiopia's celebration of the International Year of Soils (IYS) and financed by the United States government's Feed the Future program, through the USAID-funded Agricultural Knowledge, Learning, Documentation and Policy (AKLDP) Project. These proceedings were edited and designed by editors4change Limited and Norridge Walker, through AKLDP.

Agricultural Knowledge, Learning, Documentation  
and Policy Project (AKLDP-Ethiopia)

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## List of Acronyms and Abbreviations

AKLDP	Agricultural Knowledge, Learning, Documentation and Policy Project
AfSIS	Africa Soil Information Service
AGRA	Alliance for a Green Revolution in Africa
ATA	Agricultural Transformation Agency (Ethiopia)
Ca	calcium
CASCADE	'capacity building for scaling up of evidence-based best practices in Ethiopia'
CGIAR	Consultative Group for International Agricultural Research
DAP	diammonium phosphate (fertilizer)
EAS	Ethiopian Academy of Sciences
EIAR	Ethiopian Institute of Agriculture Research
ESSS	Ethiopian Society of Soil Science
FAO	Food and Agriculture Organization (of the United Nations)
GIZ	Gesellschaft für Internationale Zusammenarbeit (the German Federal Enterprise for International Cooperation)
HLI	higher-learning institution
ISFM	integrated soil fertility management
IYS	International Year of Soils
K	potassium
Mg	magnesium
MoANR	Ministry of Agriculture and Natural Resources
N	nitrogen
NGO	non-governmental organization
P	phosphorus
RARI	Regional Agricultural Research Institute(s)
SDGs	Sustainable Development Goals
SLM	Sustainable Land Management
SSA	Sub-Saharan Africa
SWC	soil and water conservation
USAID	US Agency for International Development
WFP	World Food Programme

## Foreword

Soil is a non-renewable natural resource that has undergone millions of years of degradation in terms of volume and quality, including depletion of its nutrient content. Due to the delay in controlling the problem and a 'business as usual' attitude, the world has started to witness extinction of the soils. The problem is greatly exacerbated in developing countries, particularly in Sub-Saharan Africa, where food insecurity, poverty and rising population pressures are significant. Our dependence on soil is growing by the day, since we have to produce more food for the growing global population. However, we cannot sustainably benefit from our soil resource unless we strengthen our efforts to conserve it and pass healthy soil on to future generations.

The 2015 International Year of Soils has taught us a lot in terms of where we are heading by not caring for our soils. We believe the public sector, policy-makers and heads of governments have been alerted to stop and think about the precarious soil resource, and the need to give more emphasis to soil health and care on a continuous basis. The stakeholders' workshop deliberations, which have been compiled into these proceedings, also highlight that the concern and campaign to maintain good soil health is a lifetime task

– one that will pass from generation to generation and will never end as long as life exists and depends on the soil for its multifaceted benefits.

**We cannot sustainably benefit from our soil resource unless we strengthen our efforts to conserve it and pass healthy soil on to future generations**

The historic gathering would not have been realized had it not been for the consideration and support of USAID's Feed the Future Program and AKLDP, in particular, for which the organizers are very grateful. We believe and stress that this is the beginning of our long journey, which will not succeed unless all actors join hands and sing the song together. In the process, it is inevitable that thousands of role models will be created to sustain the endless campaign.

*Healthy soils for healthy life!*

**Tekalign Mamo (Prof.)**

*UN FAO Special Global Ambassador for 2015*

*International Year of Soils*

*Ethiopia Stakeholders' Workshop: Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity*



## Executive Summary

### Introduction

Following the endorsement of the 68th UN General Assembly, the International Year of Soils (IYS) 2015 was celebrated across the globe under the motto: *'Healthy Soils for Healthy Life'*. Here, the UN General Assembly declared 2015 as the International Year of Soils and 5 December the annual Day of the Soil.

The Food and Agriculture Organization of the United Nations was nominated to implement IYS 2015, within the framework of the Global Soil Partnership and in collaboration with governments and the Secretariat of the United Nations Convention to Combat Desertification.

The IYS 2015 aimed to increase awareness and understanding of the importance of soil for food security and essential ecosystem functions.

The specific objectives of IYS 2015 were to:

- Raise full awareness among civil society and decision-makers about the profound importance of soil for human life
- Educate the public about the crucial role soil plays in food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development
- Support effective policies and actions for the sustainable management and protection of soil resources
- Promote investment in sustainable soil management activities to develop and maintain healthy soils for different land users and population groups
- Strengthen initiatives in connection with the Sustainable Development Goals (SDGs) process and Post-2015 Agenda
- Advocate for rapid capacity enhancement for soil information collection and monitoring at all levels (global, regional and national)

### Ethiopia Event

Ethiopia marked the event with different activities, with the aim of raising awareness among the general public, sector professionals, as well as policy-makers

about the importance of soil for healthy life. Events included a public lecture, a question and answer session on national television, and information dissemination through various other media. The celebration culminated with the Ethiopia Stakeholder Workshop under the theme *'Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity'* on 5 and 6 November 2015 at the Hilton International Hotel in Addis Ababa.

Key stakeholders attended the event, including representatives from local higher-learning institutions (universities), federal and regional research institutions, international partners, soil campaign groups, consultants and members of the press. In total, nearly 60 highly experienced and seasoned scientists and researchers, young experts and scholars, sector representatives, policy-makers and international partners were in attendance.

Formal speeches were made to mark the official opening of the two-day event. Among the speakers were: a representative of the State Minister of Natural Resources, Ato Mesfin Berhanu, Director of the Ministry's Soil Fertility Programme; Chief of Party of Feed the Future, US Agency for International Development (USAID), Ato Adrian Cullis; Dr. Brhane Gebrekidan, Vice-President of the Ethiopian Academy of Sciences; and Mrs. Yelleka de Nooy, Secretary of the Ethiopian Soil Campaign.

Professor Tekalign Mamo, FAO Special Global Ambassador for the International Year of Soils 2015, who took the initiative to organize the various national events on the IYS, welcomed participants to the workshop. The event was kindly sponsored by the Agricultural Knowledge, Learning, Documentation and Policy Project (AKLDP) of the USAID Feed the Future programme. Other supporters include GIZ–Sustainable Land Management (SLM), the Ministry of Agriculture and Natural Resources, the Agricultural Transformation Agency (ATA) and the media, all of which were duly acknowledged during the two-day event.

*Workshop participants*

A total of 10 presentations out of the planned 14 were made over four different sessions, with each session followed by a discussion chaired by professionals from different sector institutions.

The four sessions were organized around the following themes:

- **Session I: Soil Health and Fertility Trends and Implications on Agricultural Productivity**
- **Session II: Replenishment of Soil Health and Fertility**
- **Session III: Policy and Networking Perspectives**
- **Session IV: Closing Session**

The workshop was wrapped up with a closing session in which reflections were heard from workshop participants, followed by a verbal presentation of the Workshop Resolution (see section 4.2).

Realizing that healthy soils are the basis for healthy life, the participants of the workshop declared that the keys to the transformation of soil health and fertility management for sustainably increased agricultural

productivity are: policy, research, capacity building, synergy, networking, knowledge management, coordination, institutionalization and a sustainable system that includes all actors.

The Ethiopia workshop on the International Year of Soils was officially declared closed by Prof. Tekalign Mamo, FAO Special Global Ambassador for IYS 2015, who expressed his thanks and appreciation to all the partners and workshop participants for their continued support and for promoting the soil agenda. He called on all stakeholders to continue advocating the importance of soil for healthy life and to seize every opportunity to bring this burning issue to the attention of policy-makers and local and international partners.



## Opening Session

Chair: Dr. Kibebew Kibret

Rapporteur: Mr. Adrian Cullis

### Workshop Objectives and Welcome Speech

Prof. Tekalign Mamo, UN/FAO Special Global Ambassador for International Year of Soils 2015

Prof. Tekalign welcomed participants, and noted the key topics for discussion: the current global, regional and local soil status, the extent of soil fertility depletion, the problem of low crop productivity in the face of rising population and climate change, and the need for immediate collective action. He highlighted that the gathering provided an opportunity to prioritize problems, share tasks, and continue to raise awareness among the public and policy environment of the threat to soils. He also explained that a declaration would be made at the end of the workshop.

The speaker went on to express that soils are the basis for life: they provide food and nutrients, water and a good environment to crops, and enhance ecosystem services. They regulate climate change impacts and are the world's second largest global carbon sink.

### Soils are the basis for life: they provide food and nutrients, water and a good environment to crops, and enhance ecosystem services

Yet soils have received little attention in the past, and developing countries have reached a crossroads where – if they don't tackle land degradation and soil fertility limitations – they will be unable to produce enough to feed rising populations. For example, since the 1980s, land degradation has increased by about 30 per cent. In Africa alone, which has some 60 per cent of the world's uncultivated arable land, an estimated 65 per cent of arable land is degraded and loses soil nutrients worth US\$4 billion each year. For this reason, the continent, particularly Sub-Saharan Africa (SSA), has agriculture production levels one-third of

those in developing Asia and one-tenth of those of the United States.

At the same time, climate change impacts continue to negatively affect agricultural productivity, especially in developing countries. Prof. Tekalign said that it is predicted that climate change will cause yield declines for the most important crops, both rainfed and irrigated, triggering higher food prices, and a decline in calorie intake and nutrition. He also noted that by 2050, between 60 and 65 per cent additional food will be required to feed the growing population, and by 2030, about 120 million hectares more land will be needed to produce food. Nonetheless, it is not too late to reverse land degradation and replenish the fertility of soils: studies conducted by researchers from University of Bonn, Germany, have concluded that for every investment of US\$1 on land rehabilitation, the return is fivefold.

The speaker then called on participants to continue to sensitize the public and policy bodies about the need for immediate action. He mentioned activities carried out in Ethiopia as part of the International Year of Soils 2015 (a question and answer program organized in collaboration with Ethiopian television, and a public lecture hosted by the Ethiopian Science Academy), and measures to launch and implement nationally prioritized land rehabilitation and soil fertility replenishment. As a result, rural communities that were on food handouts for decades have become food secure, by rehabilitating their degraded ecosystems through productive safety net programs. Yet a lot remains to be done – such as addressing poor fertilizer use in Africa. In the worst scenario, future civil unrest in developing countries could occur as a result of natural resources degradation and food insecurity.

Before welcoming the next speakers, Prof. Tekalign wound up his remarks by thanking participants for giving priority to the program and being present to discuss soil health issues. He also expressed his appreciation to international partners and to the event sponsors, Feed the Future, AKLDP and GIZ/SLM.

## Keynote Speech: 1

**Mr. Adrian Cullis, USAID–AKLDP**

The second keynote speech was presented by Mr. Adrian Cullis, who provided the workshop with an introduction to one of the main sponsors of the event, USAID–AKLDP. USAID–AKLDP is funded by the United States government's Feed the Future initiative, which seeks to reduce poverty and improve nutrition, primarily through support to the agriculture sector. In Ethiopia, USAID channels Feed the Future funding of over US\$270 million over five years to more than 15 partners.

USAID–AKLDP is implemented by Tufts University, administered through the Africa Regional Office in Addis. The project supports agriculture sector learning and the documentation of evidence-based good practice, which is used to help inform and influence programming and policy processes.

Mr. Cullis went on to outline the origins of the workshop and the support provided by AKLDP. He explained that AKLDP's pleasure in supporting this conference derived not only from backing such a distinguished and hard-working organizing team, but also the conference content – the International Year of Soil and the theme of this workshop: *Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity*.

Engaged as it is in evidence-based good practice, AKLDP immediately recognized the direct impact that transforming soil health and fertility management for sustainable increased agriculture productivity will have on the lives and livelihoods of Ethiopia's 11 million farming families.

As a keen gardener of a small vegetable plot, the speaker demonstrated his personal interest and enthusiasm for the topic. He also noted that the workshop was all the more important in light of Ethiopia's historically poor management of its soil resource. At the turn of the Millennium, for example, it was estimated Ethiopia 'exported' a billion metric tonnes of soil annually at a cost of almost 4 per cent of agriculture gross domestic product (GDP). In addition, as much of 25 to 30 per cent of all nitrogen was wasted

– the result of the absence of other essential micronutrients that enable crops to take up and utilize nitrogen. In short, the soil-related costs to the farming community were considerable.

For these reasons, therefore, Mr. Cullis expressed his pleasure to have had the opportunity to support the stakeholder workshop and learn more about Ethiopia's progress and development in soil health and fertility management – the hundreds of thousands of hectares of terracing, of the gains made in soil and water conservation, of progress made in on-farm improvements, including increased use of organic and inorganic fertilizers. He noted that participants would also learn about the work of different agencies and organizations, including the Ethiopian Institute of Agriculture Research (EIAR), the Ministry of Agriculture and Natural Resources and from development partners in their support of smallholder farmers in Ethiopia.



*Credit: Mr. Tigstu Gebre Meskel*

## Keynote Speech: 2

**Dr. Brhane Gebrekidan, Vice President, Ethiopian Academy of Sciences**

The third keynote address comprised introductory comments from Dr. Brhane Gebrekidan, representing the Ethiopian Academy of Sciences (EAS), whereby he first provided some background to the workshop theme. He explained that two publications by the late Dr. H.F. Murphy form the foundation of scientific study and analysis of Ethiopian soils.<sup>1</sup> Dr. Murphy and



*Credit: courtesy of GIZ-SLM Ethiopia*

his team analyzed about 7,600 soil samples from across the country for texture, pH, organic matter, nitrogen (N), phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg). It appears that Murphy's work was the nucleus and primary driver of fertilizer use in the country in the last four decades.

Ethiopia has fertile soils of a wide range of types. However, Ethiopians have not been good custodians of this irreplaceable natural resource. Murphy's work summarizes that Ethiopian soils are generally low in available N and P, but have relatively sufficient levels of available K, Ca and Mg, although this generalization varies from region to region.

Dr. Brhane explained that soil science in Ethiopia is the responsibility of many actors, including some 30 universities, EIAR, the Ministry of Agriculture and Natural Resources, regional agricultural research institutes (RARIs), Consultative Group for International Agricultural Research (CGIAR) centers, regional and international organizations, non-governmental organizations (NGOs) and the private sector. There are also many soils laboratories spread out throughout the country. However, a well-coordinated national soil science program has yet to emerge.

The speaker then summarized some of the problems and challenges that threaten the health of Ethiopian soils. These include water erosion, by far the most serious problem, poor drainage, particularly for heavy soils and in heavy rains, and the small contribution

of irrigated agriculture to overall agricultural production. Additional issues include soil salinity problems in the lowlands, high soil acidity (mainly in the highlands), and unchecked mining of soil nutrients. Inadequate fertilizer use, removal of crop residues, animal manure used as fuel and inadequate crop rotation, meanwhile, have led to soil fertility depletion. Land degradation in general – due to water erosion, poor ground cover, deforestation, natural resource deterioration, acidity and alkalinity – is also common in Ethiopia. Other dominant challenges are a shortage of organic matter and poorly developed watershed management.

**Good practices include the application of inorganic and organic fertilizers, application of bio-fertilizers, crop rotation, green manuring, agro-forestry, alley cropping and crop residue management**

During the next part of his keynote speech, Dr. Brhane suggested a way forward – i.e. suggested areas for improving Ethiopia's soil fertility status. These included the implementation of integrated soil fertility management (ISFM) across the agricultural production value chain in order to replenish soil nutrient pools, maximize on-farm recycling of nutrients, reduce nutrient losses to the environment and improve the efficiency of external inputs. In this respect, identifying an appropriate ISFM national framework and experts to form a national taskforce to develop appropriate technology options suitable for the site-specific needs of farmers is essential. Farmers also need to make effective use of fertilizers and crop management. Good practices include the application of inorganic and organic fertilizers, application of bio-fertilizers, crop rotation, green manuring, agro-forestry, alley cropping, crop residue management and relevant and site-specific soil management practices – all of which contribute to substantial improvement in crop yield through improving the bio-physical and

1 Murphy, H.F. (1959), 'The Fertility Status of Some Ethiopian Soils', Experiment Station Bulletin No. 1, IECAMA; Murphy, H.F. (1968), 'A Report on the Fertility Status and Other Data on Some Soils of Ethiopia', Experiment Station Bulletin No. 44, College of Agriculture Haile Selassie 1st University.





*Credit: courtesy of GIZ-SLM Ethiopia*



chemical properties of soils. Additional actions to improve soil fertility suggested by the speaker included increasing the supply of affordable alternative energy sources, increasing the availability of affordable feed sources, scaling-up compost preparation and carrying out on-farm trials of various aspects of soil fertility. He also recommended strengthening regional soil-testing capacity, harmonizing the soil database system and ensuring effective institutional coordination. Finally with regard to recommended actions, Dr. Brhane mentioned the importance of effectively managing soils affected by acidity and salinity, establishing a nationally coordinated Vertisols management program and the importance of supporting a strong national watershed management program.

In conclusion to his speech, Dr. Brhane highlighted the commitment of the EAS to supporting and speaking for the advancement of soil science in Ethiopia, including providing some examples of past activities by the Academy.

### **Official Opening Speech**

**H.E. Wro Frenesh Mekuriya, State Minister of Agriculture and Natural Resources (MoANR) of the Federal Democratic Republic of Ethiopia (FDRE)**

The speaker, Ato Mesfin Birhanu, Soil Fertility Improvement Directorate Director of MoANR, announced that he was making the opening speech on behalf of the State Minister, H.E. Wro Frenesh Mekuriya, State Minister of Agriculture and Natural Resources of the Federal Democratic Republic of Ethiopia. He thanked the workshop organizers, noting soil fertility

management to be one of the country's priorities to increase agricultural production and productivity.

The spokesman went on to observe that the UN General Assembly had proclaimed 2015 the International Year of Soils, and 5 December the worldwide annual Day of the Soil, with the global campaign coordinated by the UN FAO under the theme 'Health soils for Healthy life'. He outlined some of the reasons behind the global campaign: soils are the basis for healthy food production and for healthy life; soils store water, improving resilience to floods and drought; soils support the planet's biodiversity and host a quarter of total species; and soils help to combat and adapt to climate change by playing a key role in the carbon cycle. Hence, good management and preservation of soil is essential for food security and a sustainable future.

### **Good management and preservation of soil is essential for food security and a sustainable future**

Mr. Mesfin then drew the meeting's attention to the Ethiopian government's commitment to promote soil health and fertility through scaling-up sustainable land management, reclamation of acid soils, replenishing soil fertility and improving the productivity of waterlogged soils, all aimed at maintaining the soil for current and future generations while improving food security. Therefore, the MoANR wanted to take advantage of this International Year of Soils to raise awareness on the importance of soils and healthy soil management. For example:



*Credit: Mr. Tigstu Gebre Meskel*

- Over the past three decades, the Government of Ethiopia has worked to improve the productivity of dark clay soils. The outcome is higher productivity of up to three crops from the same land/season.
- The country has also implemented community-based participatory watershed development to rehabilitate the degraded lands, with this example now followed by other countries.
- In 2006, the rehabilitation of acid soils was launched, which aimed at distributing lime to correct the acidity. Millions of farmers have since benefited from the program.



*Acid soil management with lime. Credit: Prof. Tekalign Mamo*

- Unlike the past five decades, Ethiopia has now started to deliver custom-made fertilizers to its farmers, and has established a national soil resource database. There has also been digital soil fertility mapping of the country's agricultural lands and establishment of fertilizer-blending plants.

The general purposes for the soil campaign are to: raise awareness on the importance of the soil for agriculture,

biodiversity, climate change adaptation, food security, water retention etc.; exchange knowledge and experiences between various actors; and align activities for good soil health management practices in Ethiopia.

The spokesman described how, in agreement with targeted objectives, MoANR invited all soil-related ministries, NGOs and international organizations to delegate a representative to the organizing platform. This consortium of institutions and organizations, together with the Ethiopian government, organized a National Soil Campaign with various activities and events throughout the year.

The speaker continued, observing that most Ethiopian people live off the land, with this trend set to continue for some time – even though Ethiopia is the fastest growing economy in Africa. Maintaining this growth, and meeting the challenge of feeding a growing population, depends on the country's ability to increase agricultural production, productivity and economic performance. At the same time, achieving growth without impacting on the future capacity of the land needs to be planned carefully.

With regard to land and soil health or fertility issues during the past decade, the Ethiopian government has strengthened interventions in tackling key problems and is currently scaling-up best practices. It is also generating information about soil fertility status in the country, which has helped research into the types of fertilizers needed. Mr. Mesfin also stated the importance of collaboration with international partners, especially in the area of blended fertilizer production and integrated fertility management.

Finally, the spokesman emphasized the ministry's willingness to work with partners and strengthen interventions. He thanked participants for their shared experiences and wished the workshop success in its deliberations, before declaring the workshop open.



## Session I

# Soil Health and Fertility Trends and Implications on Agricultural Productivity

Chair: Dr. Kibebew Kibret

Rapporteur: Ato Mulugeta Demiss

### 1.1 Soil Health and Fertility Trends and Implications on Agricultural Productivity: Stakeholder Perspectives

Dr. Remko Vonk, Project Manager, CASCAPE

The first presenter was Dr. Remko Vonk, who presented on the activities of the CASCAPE project ('capacity building for scaling up of evidence-based best practices in Ethiopia'). The focus of the project is unleashing the potential of six Ethiopian universities, by linking farmer-defined problems to regional, national and international research results. Interventions in this respect include soil fertility management for improved varieties and validation of new technologies.

The major stakeholders are farmers. The project focuses not only on subsistence farmers/ smallholders, but also on farmers who can produce surplus. Work is carried out to address farmer-defined issues, unleash their potential, secure their food and income, and ensure that surplus production allows farmers to invest in the future.

#### Timeliness is crucial for inputs: seed that is too late is the same as no seed

Dr. Vonk explained that studies had been carried out to find out what makes a farmer willing to try new technologies. They discovered that factors such as exploring potential, facilitating input availability on time and problem solving were all crucial in this respect. Other stakeholders are irrelevant unless there is a good value proposition for farmers. If there is such a value proposition, possible stakeholders for exploring farmers' potential and problem solving are farmers themselves, research institutes (national and regional agencies, universities, NGOs), and those within the



Credit: Dr. Remko Vonk

extension system. Possible stakeholders in input supply are cooperative unions and farmers' cooperative unions (in the case of fertilizer); the private sector, other farmers and regional government (for seed); private sector actors (to supply agrochemicals) and MoANR (to advise on agrochemicals). The speaker also highlighted that timeliness is crucial for inputs: seed that is too late is the same as no seed. So, for example, farmers may prefer to grow wheat because they know the seed will be supplied on time.

The presenter went on to explain that farmers' perspectives are the drivers of adoption: i.e. there are many factors that influence whether farmers adopt or do not adopt improved practices. Many technologies are released, but few are adopted; hence if drivers and inhibitors of adoption are understood and acted upon, there might be a higher chance of adoption.

Dr. Vonk then spoke about methodologies used by CASCAPE to research drivers and inhibitors of technology adoption, and presented some findings for sorghum, potato, wheat and barley. In particular it was noted that packages of technology were seldom adopted, with farmers usually preferring single practices. With the full study due for release at the time

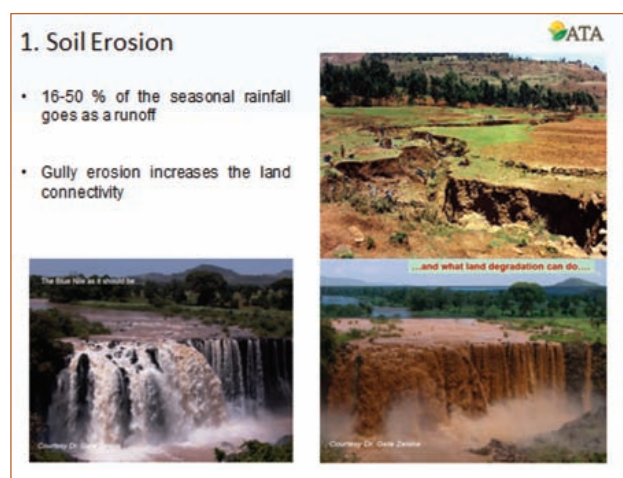
of the workshop, the speaker was able to make additional recommendations based on this research. These were:

- That research and extension systems should hasten technology adoption by matching demand and supply of technologies.
- That urgent interventions are required in low-cost and appropriate row-making technology generation.
- The extension system also needs to move from production-oriented advice and support to become more market oriented. This will require building the capacity of extension personnel in farm management, cost-benefit analysis, and market intelligence and commercial farming.
- Finally, there is a need for the natural resource extension system to promote more combined use of physical and biological methods.

## 1.2 Soil Health and Fertility Trends and Implications on Agricultural Productivity: Country Perspectives

Dr. Selamyihun Kidanu, Agricultural Transformation Agency (ATA), Ethiopia

The second presentation was given by Dr. Selamyihun Kidanu from ATA, who first provided some background information on the topic. This included



Source: Dr. Selamyihun Kidanu

that agriculture employs more than 80 per cent of Ethiopia's population, contributes around 40 per cent to GDP and more than 60 per cent to exports. Smallholders account for 96 per cent of Ethiopia's total cultivated area, with most residing in the moisture-reliable, cereal-based highlands. More than 80 per cent of agricultural lands have undulating topography, with up to 60 per cent slope, while crops mainly comprise teff, wheat, sorghum and barley.

The speaker then explained soil health to be an integrative property that reflects the capacity of soil to respond to agricultural intervention – so that it continues to support both agricultural production and the provision of other ecosystem services. Such health is dependent on the maintenance of five major functions: carbon transformations; nutrient cycles; soil structure maintenance; water capture and infiltration; and the regulation of pests and diseases. The inputs to soil health – which according to Dr. Selamyihun can increase yields by 100 to 500 per cent – comprise inorganic and organic fertilizers, biofertilizers and soil amendments (lime, inoculants). In addition, sufficient moisture in the soil and the use of improved seeds, planting materials and crop–livestock integration are required for optimal crop yields.

With the use of graphs, Dr. Selamyihun demonstrated a positive trend in overall fertilizer sales and consumption in Ethiopia, particularly since 2000. However, this he explained was no cause for complacency – as the yield pattern by crop was still considerably lower than the world average.

The speaker then moved on to present on the topic of major soil health issues, highlighting soil erosion and land degradation as major causes of low productivity and smallholder vulnerability. Annual soil loss is about 42 tons per hectare, reducing crop production by up to 30 per cent (Pimentel, 2003).<sup>2</sup> Further soil health issues included nutrient depletion, from, for example, nutrient export (e.g. of cow dung and maize stover sold as an energy source); seasonally waterlogged soils; soil acidity (strong soil acidity affects 28 per cent of the country); and salt-affected soils (about 1.5 million

2 Pimentel, D. (2003), 'World Population, Food, Natural Resources and Survival', in *World Futures*, 59, pp. 145–167.

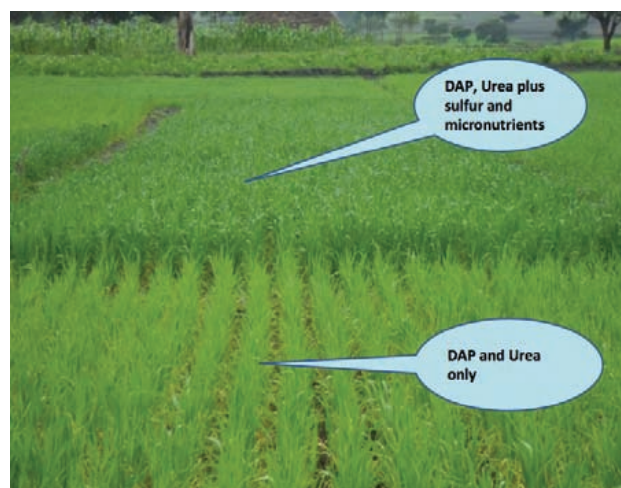
hectares of fertile valley-bottom soils are affected by salinity, with the problem increasing owing to poor on-farm water management). Finally, Ethiopia's soils suffer a mismatch between fertilizer technology and the environment, requiring the gathering of up-to-date and spatially explicit information about conditions and trends of soil health.

### Progress is being made in the development of appropriate policy change, 'doubly green' technologies and strategies, and improved research and development systems

The presenter next addressed the issue of national soil health and fertility initiatives being undertaken to tackle these challenges, such as improved Vertisol (heavy clay soil) management, acid soil management (through the use of agricultural lime – promoted since 2006) and community watershed development. A national soil information system is also being established along with national soil fertility mapping, with the aim to evaluate levels of nutrient depletion and recommend a new set of fertilizer blends and conservation and land management interventions within the next five years. At the time of writing, five fertilizer-blending plants had been established and were in operation

Dr. Selamyihun presented to the meeting some demonstrations and validation of new fertilizers recently carried out in Ethiopia. Examples included the outperformance of a wheat crop in Oromia fertilized

with DAP (diammonium phosphate), urea, micronutrients and sulfur when compared to the same crop and variety fertilized with DAP and urea only; and data collected from 1,000 plots from the four regions indicating that blends plus urea result in an increased average grain yield.



DAP, urea plus sulfur + DAP and urea only. Credit: AGP/made

Finally, Dr. Selamyihun provided the following conclusions:

- sustainable intensification of farm production – through the use of improved inputs that raise productivity and sustain increases in land productivity – is a major food security and economic growth issue in Ethiopia, given growing land constraints and soil degradation;
- progress is being made on various fronts, notably in the development of appropriate policy change, 'doubly green' technologies and strategies, and improved research and development systems;
- most recent agricultural development strategies and programs are centered on fertilizer promotion, along with the provision of improved seeds, credit and farm management practices; and
- since supplies of organic fertilizer and the scope for increased fallowing are limited, any significant growth in fertilizer use will depend on an increase in the application of chemical fertilizers.

### Discussions following Session I

During the discussion participants raised some questions, which they addressed to the two presenters.

#### 3. Community Watershed Development

- So far, >15 M ha degraded land rehabilitated
- focus over time has shifted from food relief to land conservation and then to livelihoods

Example of stable watershed and intensive treatment

Source: Dr. Selamyihun Kidanu



Responses and explanations from Dr. Volk:

- In response to a question about the observation that single technology practices were more likely to be adopted than a package of technologies, Dr. Vonk said that he did not necessarily recommend single practice over packages. Rather, he demonstrated farmers' perceptions. However, he did believe that packages should not be too complex.
- In the study, access to credit negatively affected the adoption of inputs on barley. Dr. Vonk explained that this was because farmers in the intervention areas used the available credit to input into other crops, as these were their priority over barley.
- Another questioner observed that soil fertility issues were not mentioned as factors or drivers of adoption. Dr. Vonk explained in response that CASCAPE was working on soil fertility improvement practices using different crops as test crops.

- A final question asked who was responsible for the production of tailored fertilizer blends. In response, Dr. Selamyihun said that fertilizer-blending facilities were owned and run by farmers' cooperative unions and are supported by MoANR, Bureaus of Agriculture and ATA.

Professor Tekalign Mamo expanded further on two of the points above. He said that fertilizer policy and guidelines for blending were being developed to support the effort, and were expected to be approved for use soon. These would contribute to smooth implementation. Concerning the watershed management activities, research from the University of Bonn found there to be a US\$5 return for each dollar invested.

### **Concerning the watershed management activities, research from the University of Bonn found there to be a US\$5 return for each dollar invested**

Responses and explanations from Dr. Selamyihun:

- In response to a question about research into salt-affected soils, Dr. Selamyihun said that EIAR and RARIS are working on this topic, but the work only started recently and is mainly focused on adaptation trials – hence detailed study results are not yet available.
- Clarifying on a question regarding the 70 per cent production increase referred to in Dr. Selamyihun's report, the presenter confirmed that this increase was from productivity improvements (especially in recent years) not from increasing land area.
- Regarding a question about the community-based participatory watershed management activities, Dr. Selamyihun said that there were no comprehensive studies on the profitability of these activities. However, he confirmed that benefits could be seen, not only from an economic point of view, but also from the ecosystem service aspect as well. Universities are expected to undertake studies on the topic.

## Session II

# Replenishment of Soil Health and Fertility

Chairman: Dr. Yihene G. Selassie

Rapporteur: Ato Tegbaru Bellete

### 2.1 Ensuring Community Ownership of Rehabilitation of Degraded Ecosystems: the Experience from Ethiopia

Ato Aklilu Mesfin, Ministry of Agriculture and Natural Resources

Mr. Aklilu Mesfin (who presented on behalf of Ato Tefera Tadese) introduced the first presentation of the second session with some information about Ethiopia's forest resources. These used to cover around 40 per cent of the country, but are now well below this figure due to population pressures and resulting deforestation. This, in turn, has caused soil erosion (mainly by water) and land degradation.



Credit: Mr. Aklilu Mesfin

The speaker went on to provide some historical background on the topic of rehabilitation of degraded ecosystems. He explained that drought in the early 1970s brought about massive (top-down) assistance from government and international organizations to support wide-scale soil conservation, afforestation and water harvesting. During this period, various actions were implemented, including an approach known as 'no-inputs conservation' or area closure. This took on particular significance during the late-1980s: in just 11 years, some 400,000 hectares of land were closed off. In



Community-led land rehabilitation activities. Credit: Prof. Tekalign Mamo

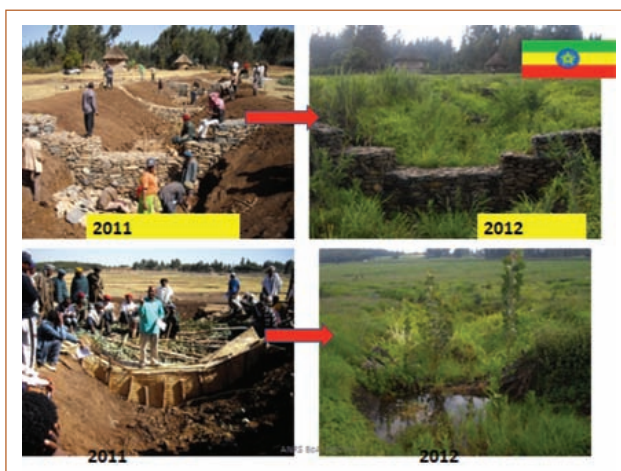
many cases, areas of land were quickly rehabilitated using this method. However, expansion was difficult because local farmers needed space for their livestock, and areas were subject to illegal cutting and grazing.

Overall, Mr. Aklilu summarized, past efforts were characterized by a top-down approach, lack of community participation during planning, blanket recommendations, and lack of management or maintenance of rehabilitated ecosystems.

Past failures – along with participatory planning gaining popularity and the realization that farmers' views needed to be taken into account to achieve sustainability – resulted in a shift in policy. The Ministry of Agriculture and Natural Resources and its international partners developed participatory and community-based watershed planning guidelines: the Local Level Participatory Planning Approach. Project 2488 (the UN WFP Food for Work program) officially changed its name to Managing Environmental Resources to Enable Transitions to a more sustainable livelihood (MERET). Other NGOs followed suit, and soon it was felt necessary to develop a new guideline, the Community-Based Watershed Development Guideline (CBPWDG). There followed some major structural changes in the country, including decentralization, and the creation of



regions and the Ministry of Natural Resources and Environmental Protection. In 1994, a watershed management and land-use study was established, followed by the creation of the Soil and Water Conservation and Land Use Department (now the Natural Resources Management project).



Source: Mr. Aklilu Mesfin

Mr. Aklilu then outlined how soil and water conservation has since been implemented through project-based initiatives (reforestation, afforestation, soil fertility management, water development, infrastructure development etc.) and community participation/mobilization (through a development army structure). In addition, capacity building, identification and documentation of best practices, and sharing of experiences are also taking place.

### **Recent trends have also included rehabilitated degraded ecosystems being given priority to create employment opportunities for organized youth groups**

As part of these efforts, the Sustainable Land Management Project (SLMP) was initiated in 2008. This project ran until 2013, treating more than 100,000 hectares of communal lands and 117,000 hectares of farmlands and homesteads. At the same time, areas of special scientific interest (SSIs) were established, lands were put under area closure, and ponds were constructed, among other activities.

Recent trends have also included rehabilitated degraded ecosystems being given priority to create employment opportunities for organized youth groups, for example

through beekeeping, forestry, grass and forage production for animal fattening and fruit production.

In the final part of his presentation, Mr. Aklilu highlighted a number of major constraints and challenges that still remain. These include:

- inadequate research on the topic;
- ensuring adequate watershed development activities in terms of quality and quantity, particularly in pastoral areas;
- the need for integration and further fine-tuning to maximize production (fertility management, use of improved varieties etc.);
- inadequate capital to invest in land management;
- free grazing; and
- the necessity for more work on ownership and sustainability.

## **2.2 Rethinking Soils**

Dr. Georg Deichert, GIZ

The second presentation of the session was provided by Dr. Georg Deichert, GIZ, who commenced his talk by distinguishing soil fertility (a combination of physical and chemical properties) and soil health (soil fertility plus soil biology). In mainstream agriculture, soil is merely a chemical and physical entity, a medium for carrying plants and holding plant nutrients.

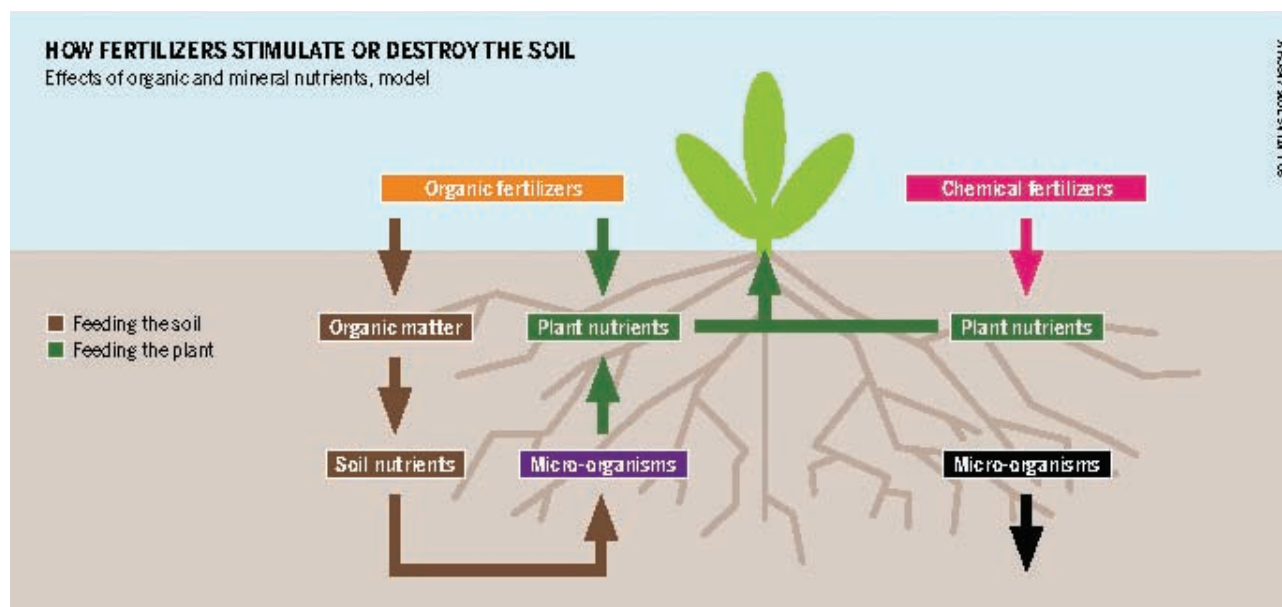
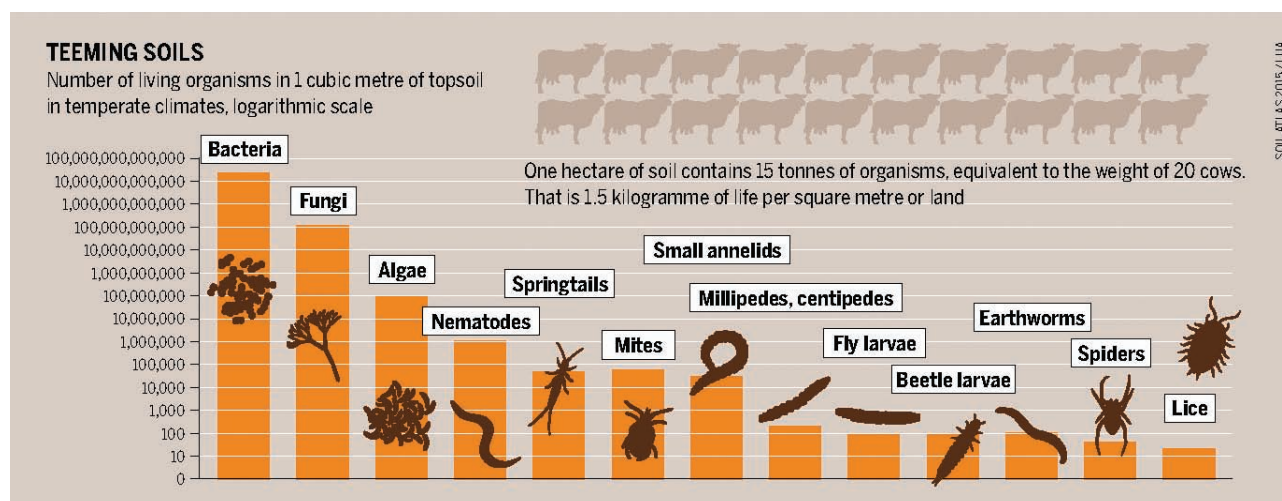
Agricultural chemistry has been the dominant approach to soil fertility, and continues to guide the practices recommended to farmers. Yet, Dr. Deichert explained, agricultural science and practice ignore that the soil is a living system – and needs to be treated accordingly. Likewise, economic thinking considers soil to be a mere factor in production, with no attention given to its being a living entity that contains billions of organisms in just one handful.

The speaker went on to provide some historical insight before presenting on the components of soil systems (mineral elements, water, air, organic material) and their dynamics. In particular, he noted that the organic portion of soils includes both soil organisms and the various biological substances and processes that animate soil systems. Soil health is more than the abundance of certain chemicals, but is rather the effect of countless

interactions among organisms and the substances on the surface and within the soil. By breaking down chemical components, the soil biota continuously replenishes the pool of nutrients that is available for plants and other biota. Plants, and especially roots, are themselves active participants in soil processes. He emphasized, therefore, that we should be aware that we are not fertilizing plants but rather nurturing the soil.

Dr. Deichert continued his presentation, outlining some principles in nature and guidelines for husbandry of the land:

- *In nature, soil is always covered* (ideally, plants cover the soil permanently)
- *There is always a diversity of plants* (at least two species should grow in a field)
- *There is always a cycle of nutrients* (all available organic matter should be returned to the land to increase the humus content of the soil)
- *Plants regulate the uptake of nutrients on their own* (this should not be disturbed by applying synthetic fertilizer)
- *Vegetation absorbs optimum sunlight* (cropping systems should permit optimal utilization of sunlight by vegetation)
- *Soil 'ploughs' or cultivates itself* (as far as possible, soil organisms, animals and soil aggregates should not be disturbed by tillage or other practices)
- *Life is interconnected* (self-regulating processes among interconnected species in the soil and plant community should be respected and, if possible, not disturbed)



From these principles, the speaker proceeded to explain the implications for soil system thinking. The first of these was that many current standard agricultural practices have negative impacts on soil systems, with new cultivation methods bringing new problems. For example, plowing causes erosion, synthetic fertilizers cause unbalanced soil chemistry and biology, and some agrochemicals disturb the balance of soil biota and reduce biodiversity. At the same time, these practices tend not to address the causes of deteriorating soil systems.

**Soil health is more than the abundance of certain chemicals, but is rather the effect of countless interactions among organisms and the substances on the surface and within the soil**

Biologically based approaches, on the other hand, aim to improve conditions that will support sustainable and beneficial natural processes, thereby contributing to soil creation, solubilization and recycling of nutrients, improvement and stability of soil structure, and detoxification.

Further implications stemming from the above principles include that less humus means lower soil fertility, that while fertilizers are seen to be vital to increase food production, the long-term damage they cause to soil is often forgotten, and that producing and marketing nitrogen, phosphors and potassium takes a lot of investment – hence the industry is dominated by big business.

From this analysis, the speaker moved to outline a final set of implications: the need for an orientation towards agro-ecological approaches and understanding of sustainable agriculture:

*Sustainable agriculture is any principle, method, practice or philosophy which aims to make agriculture ecologically sound, economically viable, socially just, culturally acceptable and is based on a holistic science*

While synthetic fertilizer is like a medicine against a disease that acts primarily against the symptoms, compost basically is healthy soil.

In conclusion, therefore, Dr. Deichert emphasized that the underlying principle of soil fertility management is to ‘feed the plant’, but soil health management is to ‘feed the soil, not the plant’.

## 2.3 Making Integrated Soil Fertility Management (ISFM) Work for Africa

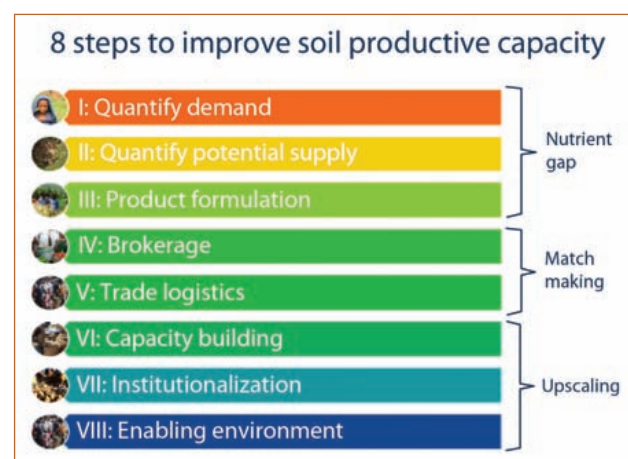
Dr. Christy van Beek, Coordinator CASCAPE and Project Manager, Fertile Grounds Initiative

The next speaker, Dr. Christy van Beek, presented to the workshop on integrated soil fertility management (ISFM), commencing with some figures on nutrient depletion in Ethiopia. She noted that organic matter depletion equals about 3 tonnes per hectare per year (equivalent to about 2.5 per cent depletion per year), while soil mining increased on average between 2011 and 2015, especially for N.

In terms of addressing the problem, integrated use of organic and mineral sources of nutrients and best agronomic practices have obtained the best results, yet – Dr. van Beek observed – ISFM is still not common practice.

She went on to introduce participants to the Fertile Grounds Initiative:

*A coordinated strategy of collaboration between actors in nutrient management. It is based on bringing together supply and demand for nutrients within a specific geographical area, to process these and to make optimum use of site-specific interventions and available nutrients, supplemented by external imports*



Source: Dr. Christy van Beek



Dr. van Beek then highlighted the eight steps to improve soil productive capacity

Next, with liberal use of figures and graphs, she explained how the Fertile Grounds Initiative makes ISFM work – by bringing together actors in mineral and organic fertilizer production, along with farmers and traders for transport. Yet first the total nutrient requirement has to be determined: this is done using a 'soil fertility toolkit', which contains modules on soil organic matter, fertilizer recommendation, erosion (SWC) and integrates local field data with online legacy data.

Dr. van Beek explained that in terms of the eight steps to improve soil productive capacity, the initiative is currently at step III (product formulation), with plans to begin capacity building (step VI) between 2016–18.

Case studies in Ethiopia, Uganda and Burundi are currently being carried out to test the concept. The speaker briefly summarized the two studies being carried out in Ethiopia, in Adet and Ziway, and listed activities due to take place in 2016, including a scoping study, determining organic fertilizer (compost) potential availability and quality, and determining nutrient and mineral fertilizer requirements. The case studies would then progress to product formulation and establishing a platform to match supply and demand for nutrients (organic and mineral).

The speaker concluded the presentation with a brief infographic that synthesized the organization and outlook of the Fertile Grounds Initiative.



Source: Dr. Christy van Beek

## 2.4 Sustainable Soil Management Initiatives in Africa: Experience from AGRA

Dr. Bashir Jama, AGRA, Nairobi, Kenya

The fourth brief presentation of Session II was given by Dr. Bashir Jama on the Alliance for a Green Revolution in Africa's (AGRA) experience with sustainable soil management. Dr. Bashir first outlined the problem, i.e. the low productivity of smallholder agriculture. Nonetheless, he said, there has been an upward trend in agricultural productivity in recent years – the supply of fertilizer is growing and the supply chain is improving. In addition, grain legumes are proving to be a productive and profitable option for integrated soil fertility management (ISFM).

### A network of 25,000 agro-dealers has been trained, while 125,000 tonnes of certified seed were produced in 2014

The speaker went on to provide some further possible solutions to address low agricultural productivity – examples of successful models that can be scaled-up:

- A network of 25,000 agro-dealers has been trained by AGRA
- Private sector-led seed production (125,000 tonnes of certified seed produced in 2014)
- Fertilizer blending (five facilities established in Ethiopia)
- ICT application through e-extension, e-platforms, e-finance
- Risk-sharing financial products
- Policy nodes and hubs, and country-level soil health consortia

He also emphasized that access to farm input finance is essential if yields are to increase, and presented Nigeria's franchise model (the Babaan Gona project) as a possible pathway to scale-up successful models and practices.

Despite past improvements, Dr. Bashir concluded, climate change is a major threat to rising productivity and input use. Hence it is important to scale-up climate-resilient production technologies (e.g. pigeon pea and maize intercropping, combined with fertilizer microdosing), and to strengthen capacity for research and development, and further networking.

## 2.5 Assessing the Extent and Condition of Africa's Cropland Biome

Dr. Markus Walsh, Africa Soil information Service (AfSIS), Arusha, Tanzania

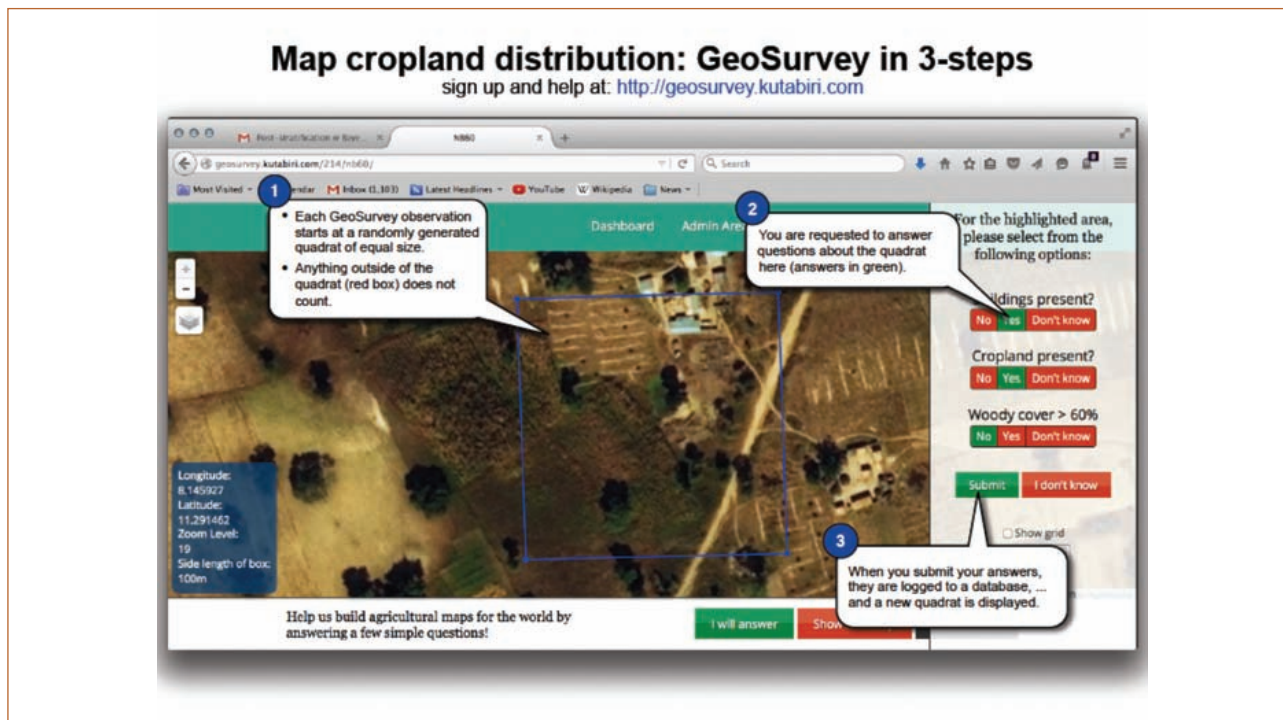
The final short presentation was made to the workshop session by Dr. Sam Gamada (Senior Research Fellow, IFPRI) on behalf of Dr. Markus Walsh, AfSIS, who demonstrated how to use GeoSurvey to map cropland distribution, providing examples from Tanzania.

He was then able to provide 1MQ predictions for Africa for the presence of cropland, buildings, topsoil (0–20cm) pH predictions, cropland with predicted lime requirements and cropland organic carbon stock predictions. The final two cropland measurements demonstrated were for Fraction of Absorbed Photosynthetically Active Radiation (FAPAR), 2001–15, and Mean Annual Precipitation (annual rainfall measurements; MAP), 1998–2015.

## Discussions following Session II

Following the brief presentations, participants raised their reflections, comments and questions. Some of these, along with responses, were as follows:

- In response to a question about assessing the impact of watershed management (presentation 2.1), the speaker confirmed that impact assessment of watershed management is being implemented every two to three years. Resources do not limit such assessments, rather there needs to be a tangible research agenda.
- In response to a question about the German experience of 'feeding soils, not plants', the presenter answered that less than 10 per cent of farmers in Germany are not following standard procedures.



Source: Dr. Markus Walsh



## Session III

### Policy and Networking Perspectives

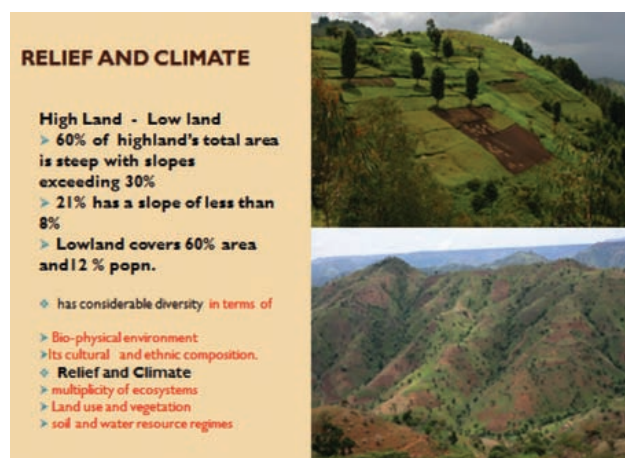
Chairman: Dr. Tadele G. Selassie

Rapporteur: Ato Fanosie Mekonen

#### 3.1 Land Tenure Policy

Ato Tigstu Gebre Meskel, Ministry of Agriculture and Natural Resources, Rural Land Administration and Land Use Directorate (LAUD)

Session III commenced with a brief presentation by Mr. Tigstu G. Meskel, Director of LAUD in the Ministry of Agriculture and Natural Resources. He introduced his talk with some background statistics and general facts about Ethiopia, its relief and climate.



Source: Mr. Tigstu Gebre Meskel

He then explained the country's historical land management arrangements and policy with reference to three broad time periods: before 1975 (feudal system, insecure tenure); after 1975 (nationalization of rural land, land redistribution, tenure security further weakened); and after 1991 (1994 Constitution enshrines the concept of public land ownership, but with rights of exchange, donation, inheritance, rent etc.).

Mr. Tigstu also provided an overview of Ethiopia's current land policy, legal tenure rights, organization and implications for land governance. He noted that land tenure insecurity has forced farmers to favor short-term exploitation over long-term conservation of the land. Farmers are also reluctant to invest because of tenure insecurity and have no incentive to take good

care of and improve the land they cultivate. As a result, the Government of Ethiopia has committed to enhance rural land security by: expanding and improving the ongoing registration and certification of rural land-use rights; and reforming the legislative framework and rules to facilitate the transfer of rural land-use rights.

**Some of the most important impacts of first-level land registration have been a reduction in land-related disputes and improvements in women's empowerment**

Mr. Tigstu expanded briefly on the types of land registration (first-level registration and certification; and second-level registration and certification). Some of the positive impacts of the first-level registration programs in Ethiopia have included better security of tenure, increased investment in technologies and soil and water conservation, more tree and perennial crop planting, increased productivity, and improved access by women to land. Among these, the speaker emphasized the importance of the consequential reduction in land-related disputes and improvements in women's empowerment.

Nonetheless, there have also been weaknesses in the first-level certification program, including inaccurate area measurements, a lack of updating/maintenance of the system, lack of – or poor – documentation, informal transactions and lack of geo-referenced maps with certificates. These constraints have led to the system being unsuitable for analysis and decision-making at any level.

As a result, it was decided that cadastral surveying of rural lands was required in Ethiopia (the second-level registration and certification), in order to: sustainably conserve and develop natural resources based on the

different agro-ecological zones of the country; establish an information database that identifies the size, direction and use rights of different types of landholdings; and to put in place legal conditions that are conducive to the strengthening of the land-use rights of farmers. Since the decision, there has been ongoing debate as to the best and most appropriate cadastral survey methodologies for the rural lands of Ethiopia.



Source: Mr. Tigstu Gebre Meskel

In conclusion, the presenter mentioned the need to strategize utilization of land and its management so that the land-use changes are not detrimental to the sustainable development of the country. Core issues of such a land utilization policy include meeting the demands of urbanization, industrialization, the mining sector and the transport sector; considering development versus sustainable development; protecting social interests and heritage; and ensuring adequate land-use planning capacity.

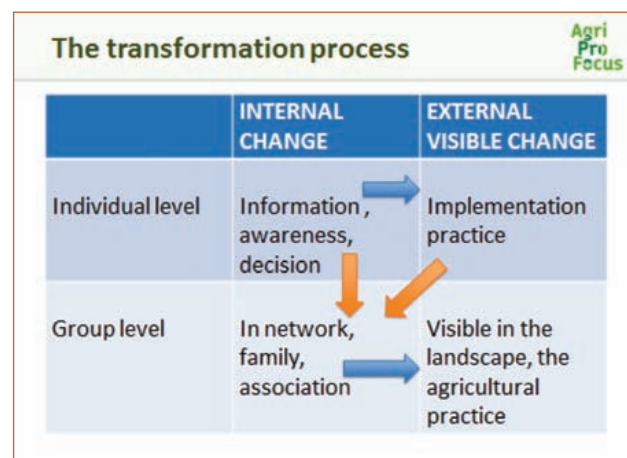
### 3.2 Partnerships, Advocacy and Awareness Creation in Soil Health and Fertility

Mrs. Yelleke de Nooy, Agri-ProFocus

The penultimate presentation of the workshop was provided on the topic of 'partnering for synergy' by Mrs. Yelleke de Nooy from Agri-ProFocus, who spoke first about demand for knowledge exchange and synergy on soil health management. She highlighted that earlier presentations had already indicated the need for synergy and coordination, that is:

- the need to coordinate research in a national research programme on soil (between universities, EIAR, CGIAR, graduate students, Regional Agricultural Research Institutes [RARIs], agricultural technical vocational education and training);
- the need for collaboration and knowledge exchange between institutions (government, NGOs, donor and knowledge institutions, companies, agribusiness); and
- the need for a network of agro-dealers, private-sector seed production and regional nutrient management.

The speaker then elaborated on the notion of networking as a tool for agenda forming and implementation. In doing so, she contrasted project management (characterized by an expected output, plan, recruitment of people, implementation and final result) with network development (characterized by involvement of people with 'heart'/investment in a topic, enthusiasm for results, awareness of interdependence, pooling of energies, creating output, people enjoy collaboration/inspiration). She presented a figure to depict the transformation process (below).



Source: Mrs. Yelleke de Nooy

The speaker highlighted the three pathways to achieve such transformation by 2020: 1) development of technologies, seed, fertilizer and access; 2) information and knowledge for best practices; and 3) the provision of enabling circumstances via policy, collaboration, coordination, research and information sharing. The Soil Health Innovation Community (Platform) has been established to work on pathway 3 – in order to

accelerate internal change via sharing knowledge, materials and tools, collaborating, peer visits, an inventory of technologies and dissemination through the network.

Mrs. de Nooy informed the meeting of activities due to take place as part of the Ethiopian Soil Campaign in the coming months, including a radio programme, workshops and conferences, demonstration sites and regional events, before concluding the short presentation by confirming the ongoing continuation of the Soil Health Platform post-2015. This will take place via:

- a national research programme coordinating activities from universities, EIAR, RARIs, CGIAR and ATA;
- providing farmers with public money to buy inputs; and
- increasing capacity building for extension and Bureaus of Agriculture on integrated soil and water management and integrated nutrient management.

### 3.3 The Role of Higher-Learning Institutions in Promoting Soil Health and Fertility Management Knowledge

#### Dr. Sheleme Beyene

The final talk was given by Dr. Sheleme Beyene, who first spoke to participants about higher-learning institutions (HLIs) – such as universities, university colleges, colleges and institutes – and their responsibilities: developing curricula programs leading to diplomas, first degrees, second degrees and doctoral degrees (PhDs). He showed the distribution of Ethiopian public universities on a map and informed that higher education in agriculture in the country had started in the 1950s. Dr. Sheleme further elaborated on the responsibilities of HLIs, which also include training, research and outreach/ community service.

The speaker then went on to outline the types of training that are available in soil resources and management, including providing some figures on graduate training in soil science at six Ethiopian universities. He gave some information on research on soil quality and fertility management in Ethiopia,

including specific examples of graduate research. Work on soil resource management includes soil fertility assessment and mapping; lime requirements and liming; amelioration of salt-affected soils; management of waterlogged soils; water harvesting; and erosion control, among others. However, he wished to emphasize that networking and sharing of results was still lacking.



Source: Dr. Sheleme Beyene

Finally, Dr. Sheleme concluded with some future directions for HLIs in promoting soil health and fertility. In terms of training, these included providing a comprehensive soil education program, strengthening capacity for R&D; and designing modules and tailor-made courses that address the specific problems of specific sites. In research, future directions included engaging graduate students in research activities pertaining to soil health and fertility management; collaboration with other research organizations; validating initiatives; and creating a database on soil health. It will also be important to develop a soil health evaluation protocol through which to evaluate soil health assessments. Last, with regard to dissemination, future directions included creating general soil health awareness; producing manuals and guidelines for maintaining and sustaining soil health; initiating demonstration trials and networking among institutions to create soil health websites; and continuing with the Soil Health Day initiative.



## Discussions following Session III

Following the brief presentations, participants raised their reflections, comments and questions. Some of these, along with responses, were as follows:

- In response to a question about the implications of the land tenure system for soil management, Mr. Tigstu noted that securing land tenure means creating ownership for farmers, and building confidence and trust so that farmers will invest in – and properly manage – their land. Hence land tenure is one of the essential criteria for proper soil management.
- Another questioner raised the issue of how land-use policy might address problems of unemployment. In response, Mr. Tigstu said that some regions were handing over communal and degraded lands to young people to manage and secure the resulting benefits. As a result, many landless youth are participating in income-generating activities such as beekeeping and animal fattening, having reclaimed degraded lands. Practices such as bench terracing on steep gradient/sloping lands are now becoming popular, with cash crops grown on the terraced land.
- A third questioner asked who was responsible for agricultural investment and environmental impact.
- The final question asked how the cadastral map and the soil fertility roadmap could be integrated. In response, Dr. Sheleme said that cadastral surveying is being carried out to demarcate the boundaries of farm plots and provide an ownership certificate that has a close-to-accurate boundary, with recommended management practices as well as obligations. The soil fertility roadmap, on the other hand, has packages of technologies and practices that need to be implemented to maintain the fertility and health of the soils. These two are therefore complementary activities.

The response was that departments within the MoANR and Ministry of the Environment, Forestry and Climate Change are responsible for agricultural investment, land tenure and environment-related issues. Although each has its own responsibilities, a joint effort is required on the part of all actors to bring about a meaningful impact.

**Securing land tenure means creating ownership for farmers, and building confidence and trust so that farmers will invest in – and properly manage – their land**



New fertilizer demonstration. Credit: Prof. Tekalign Mamo

## Session IV

### Closing Session

Chairman: Dr. Sheleme Beyene

Rapporteur: Dr. Eshetu Bekele

#### 4.1 General Discussion

*A report on reflections on the topics presented and discussed during the one-and-a-half-day workshop from individual participants*

Dr. Sheleme briefly reminded participants of the different topics presented and thoroughly discussed during the workshop, and invited participants to share their opinions, comments and suggestions.

Accordingly, the following reflections were forwarded from the participants:

**Reflection 1.** Ato Abiye Astatke, a private farmer from Debre Birhan, revealed how fruitful and timely the workshop was. However, some elements were missing in the presentation and discussion that are pertinent to soil health, such as conservation tillage, carbon sequestration and the time factor in maintaining soil fertility. In addition, he raised a question to the organizer on the need to put soil health and soil fertility separately in the title, as soil fertility is an element of soil health.

**Reflection 2.** Mrs. Yelleke de Nooy, from Agri-ProFocus Ethiopia, pointed out the need for a national soil health and fertility management group in Ethiopia to urgently address soil health issues. She also delivered information on the ongoing soil health data collection in different parts of Africa, including Ethiopia, which is facilitated by IFPRI, and urged workshop participants to contribute by contacting Dr. Zebene, who was responsible for coordinating this activity in Ethiopia.

**Reflection 3.** Dr. Abbadi Girmay, from Tigray Agricultural Research Institute (TARI), advocated on the need for frequent soil health promotion in Ethiopia and to convince parliament's agriculture focus group to raise the importance of including soil health issues into GTP2 to transform the development of Ethiopia. In addition, he suggested linking land degradation to public health

in different research projects as one of the tools to teach society how soil is important for healthy life.

**Reflection 4.** Dr. Asfaw, a member of staff from a private company producing bio-fertilizer, pointed out the need for innovative research and to look beneath the surface of the earth (at, for example, the biological components of soil) to overcome challenges related to soil health and sustainable crop productivity.

**Reflection 5.** Prof. Tekalign pointed out the need for:

- **Advocacy** for different soil health and fertility issues – by justifying how he as a soil scientist has used his role in the Ministry of Agriculture in the rehabilitation of acidic soil, in watershed management and the phosphorous agenda – to different sectors and government top officials.
- **Networking**, such as the one initiated by Agri-ProFocus's soil health platform.
- Use of venues (such as EAS, the Ethiopian Society of Soil Science [ESSS] and so on) – and strengthening of them – to provide training, organize workshops and so on.
- **Essential stakeholder engagement** beyond those sectors mainstreaming soil and with direct links with soil. Such stakeholders might include civic society, interested individuals, experienced elders, researchers and so on.
- **Sustainability**, which basically requires institutionalization, engagement of professionals and making use of their products.
- **Transformation** in terms of how to approach farmers (key actors) and soil health management.

**Reflection 6.** Dr. Brhane from EAS forwarded ways to maintain the reputation of the *Ethiopian Journal of Natural Resources* (EJNR), which is a biannual publication of the Ethiopian Society of Soil Sciences, by involving professionals from different disciplines, integrity with other disciplines and so on.



**Reflection 7.** Dr. Mohammed Assen from Addis Ababa University (AAU) insisted that all participants try their best to respond to the review request coming from the respective body and contribute to the general discussion that was to be held 4 December 2015 on how to make the journal reputable.

**Reflection 8.** Prof. Masresha Fetene pointed out the need to make soil information available to users and organize a workshop to discuss data retrieval issues. He also highlighted the need for a professionals' discussion on the reputability the *Ethiopian Journal of Natural Resources*.

**Reflection 9.** Dr. Eshetu Bekele, from Adama Science and Technology, emphasized the need to prioritize different climate, soil and crop factors that influence the agricultural productivity, stability and resilience of agro-ecosystems in different agro-ecological zones of Ethiopia. He also pointed out the need to identify what research and innovation is necessary to overcome these problems, applying integrated efforts from different sectors depending on the resources, knowledge and capacity they have.

How this roadmap will look may need further discussion among the different actors, along with common understanding. For instance, the role of higher institutions in soil health management should involve new technology development that depends on priorities for soil health management, whereas promotion and dissemination is better carried out by NGOs, extension workers and so on.

Major driving factors for the development of different technologies to maintain soil health and eco-friendly intensification of products should be considered at the farmer level, rather than being part of donor-driven agendas. Involvement of the key actors (farmers) at the first stage of technology development projects and use of appropriate communication tools are unquestionable, as these are key factors for the adoption of such technology. Moreover, it is important to promote and reward practices that contribute to soil health in different situations.

Finally, Ato Tegbaru Bellete from ATA read the resolution to the workshop participants.

## 4.2 Workshop Resolution

**Declaration of the IYS 2015 Ethiopia Stakeholders' Workshop: Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity, Addis Ababa, Ethiopia, 5–6 November 2015**

We, the participants of IYS 2015 Ethiopia Stakeholders' Workshop on Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity, held in Addis Ababa, Ethiopia, 5–6 November 2015, hereby collectively issue the following '*Declaration of the IYS 2015 Ethiopia Stakeholders' Workshop on Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity*,' directed to Ethiopia's policy-makers, academics, legislators, research institutions, NGOs, the private sector and relevant ministries, such as the Ministry of Agriculture and Natural Resources and the Ministry of Environment, Forest and climate change.

### Preamble

- Recognizing that soil is life and there is no life without soil,
- Realizing that 95 per cent of the food the world population consumes is grown on soils,
- Recognizing that soil is the second largest carbon sink, and that it enhances climate change adaptation and mitigation,
- Cognizant of the fact that the ever-increasing land degradation is threatening soil productivity in Sub-Saharan Africa (SSA), including Ethiopia, and that soil fertility depletion is an increasing challenge to Ethiopian farmers,
- Realizing that crop productivity is the lowest in SSA by world standards and this will be a great challenge for the ever-growing population,
- Realizing that the current generation has the obligation of maintaining good soil health to leave behind for the future generations,
- Recognizing that caring for and protecting soils against degradation is cheaper than rehabilitating them after the problem happened,



*Improved Vertisol management. Credit: (top left and right) ILCA (ILRI); (bottom left and right) Prof. Tekalign Mamo*

- Recognizing that soil formation is a very slow process that requires hundreds of thousands of years, and the same soil can be lost entirely in a matter of a few hours, months or years, depending on the extent of severity of erosion,
- Understanding that soils, similar to endemic plant and animal species, have started to become extinct,
- Recognizing that in many countries of the world, the soil resource has been neglected by the policy bodies and relevant stakeholders,
- Being aware that after a long silence, Ethiopia has started to take limited measures to address land degradation, improve the productivity of acid soils, Vertisols and salt-affected soils,
- Realizing that in Ethiopia, the soil resource doesn't have a focused and responsible government institution, and is not monitored regularly, except recent and inadequate actions,
- Realizing that until recently, the land-use and land-tenure system has not been given due attention among the researchers and scientific community in the country, and deliberations, if any, are fragmented, inadequate and not holistic,
- Understanding soil salinity is becoming a challenge to sustainable agricultural production as a result of the emphasis given to the development and intensification of irrigation schemes, only without giving parallel emphasis to drainage under smallholder and commercial farms levels in relation to the conservation activities,
- Recognizing that as long as there is agriculture, soil care and monitoring soil health should be a continuous process,
- Understanding soil fertility is a dynamic process that needs continuous monitoring and responsible measures,
- Understanding that improving soil health will bring sustainable agricultural production,
- Realizing that agricultural research has a great role towards increasing land, crop production and productivity,
- Recognizing that the Ethiopian Academy of Sciences, the Ethiopian Association of Agricultural Professionals (EAAP), the Ethiopian Society of Soil Science (ESSS), different agricultural professional associations and specific professional societies have a great role in transforming soil health and fertility management,
- Recognizing that educational institutions have to take a key role to leverage improved livelihoods of the next generation through good soil health and fertility-enhancing technologies and best practices, capacity building, among others,
- Realizing that Ethiopian citizens should have relevant and timely soil resource information,
- Appreciating the 68th UN General Assembly's declaration of 2015 as the International Year of Soils, and 5 December to be remembered as World Soil Day each year,
- Recognizing that soil is a public resource that requires attention and care by all citizens, and that soil is everything, and feeding the soil and plant is necessary,

We, the participants of the 5th and 6th November stakeholder workshop in Addis Ababa, representing public, private, civil society, research and higher-learning institutions, and renowned personalities in the soil health and fertility management, agricultural and natural resources disciplines in the country, decided and declared that:

1. Policy, research, education, capacity-building and extension services should focus on integrated soil and water management, and balanced fertilization.
2. Knowledge management, synergy and coordination between stakeholders must be initiated to share and take away responsibilities to work on national soil health, and that value addition efforts should

- be made to national land and soil-related initiatives such as watershed management, soil fertility replenishment etc.
3. A national soil health consortium and platform should be established and/or strengthened so that different stakeholders can exchange knowledge, experiences and demonstrate and make an inventory of available resources to mobilize.
  4. We believe sustainable finance (the credit system) should be strengthened and made more available to farmers to allow the purchase of inputs.
  5. We are committed to support the efforts of the government in soil fertility mapping and informed fertilizer recommendation efforts, and soil-related initiatives that may be started in the near future.
  6. We believe integrated soil fertility management is the approach the country has to follow to improve soil health and attain food self-sufficiency on a sustainable basis.
  7. We believe developing a national soil information system is critically important for knowledge sharing, to maintain sustainable good soil health and to contribute to better decision and/or policy formulation and recommendations, and developing guidelines.
  8. We recommend the impacts of ongoing government-led land rehabilitation and sustainable land and soil management initiatives have to be documented and fully realized, so as to support monitoring and impact assessment works.
  9. We believe that government support to the natural resources management programme has to be strengthened, and people's encroaching into marginal lands (due to population explosion) and clearing forested areas by investors for the sake of crop cultivation should be monitored.
  10. Transforming soil health and fertility management requires support from soil-testing services. Hence, this service delivery by the various institutions/organizations (MoANR, EIAR, universities and the private sector) needs coordination, guidance and capacity building.
  11. Works related to 'land utilization and administration' should be expedited so that the land certification program can become relevant and productive to support agricultural production and productivity.
  12. Coordinating the activities of various national, international, bilateral and governmental, non-governmental and inter-governmental organizations involved in soil health, land and water management has become a prerequisite. There ought to be a 'lead institution' providing guidance and leadership.
  13. We recommend educational institutions at all levels should revise their curriculum so that primary, secondary and higher-learning institutions include soil health courses to shape the next generation and maintain good soil health to leave behind for the future generation.
  14. We believe that the agricultural sub-committee of parliament and other public or private institutions recognize soil as the driving force for GTP 2 and beyond.

## Appendices

### Appendix 1 Workshop Program

Ethiopia Stakeholders' Workshop

Transforming Soil Health and Fertility Management for Sustainable Increased Agricultural Productivity

5–6 November 2015

Venue: Hilton International Hotel, Addis Ababa, Ethiopia

#### Program

Day 1 (5 November)

Opening Session:

Facilitator: Ato Shimelis Lema

Rapporteur: Mr. Adrian Cullis

Time	Topic	Presenter	Remark
8:30–9:00	Registration	Organizers	
9:00–9:10	Workshop Objectives and Welcome Speech	Prof. Tekalign Mamo, IYS 2015 FAO Special Global Ambassador	
9:10–9:30	Keynote Speech 1	IYS Secretariat, FAO, Rome	
9:30–9:50	Keynote Speech 2	Feed the Future/ USAID Ethiopia	
9:50–10:10	Keynote Speech 3	Ethiopian Academy of Sciences, Addis Ababa, Ethiopia	
10:10–10:30	Official Opening Speech	H.E. Wro Frenesh Mekuria, State Minister of Natural Resources, MoANR, Ethiopia	The Official Opening Speech was made by Ato Mesfin Birhanu from MoANR (delegated)
10:30–10:40	Introduction of participants	Self	
10:40–11:10	Group photo and health break	Organizers	

#### Session I: Soil Health and Fertility Trends and Implications on Agricultural Productivity

Chairman: Dr. Kibebew Kibret

Rapporteur: Mr. Mulugeta Demiss

11:10–11:35	Regional and Global Perspectives	Dr. Mamadou Traore, Vice President, African Society of Soil Science, Burkina Faso	This speaker was not able to participate in the workshop
11:35–12:00	Country Perspectives	Dr. Selamyyihun Kidanu, Agricultural Transformation Agency, Addis Ababa, Ethiopia	
12:00–12:25	Stakeholder Perspectives	Remko Vonk, Alterra – Wageningen UR, CASCAPE Project Manager	
12:25–13:00	Discussion	Participants	
13:00–14:00	Lunch break	Organizers	



**Session II: Replenishment of Soil Health and Fertility****Chairman:** Dr. Yihenew G. Selassie**Rapporteur:** Mr. Tegbaru Bellete

Time	Topic	Presenter	Remark
14:00–14:20	Ensuring Community Ownership of Rehabilitation of Degraded Ecosystems: the Experience from Ethiopia	Mr. Tefera Tadese, Ministry of Agriculture and Natural Resources, Ethiopia	This presentation was given by Ato Aklilu Mesfin from MoANR on behalf of Mr. Tefera (delegated)
14:20–14:40	Re-thinking Soils	Dr. Georg Deichert, GIZ/SLM	
14:40–15:00	Making Integrated Soil Fertility Management (ISFM) Work for Africa	Dr. C.L. Christy van Beek Alterra – Wageningen UR	
15:00–15:20	Sustainable Soil Management Initiatives in Africa: Experience from AGRA	Dr. Bashir Jama, AGRA, Nairobi, Kenya	
15:20–15:40	The Role of Soil Resource Information in Maintaining Good Soil Health and Fertility	Dr. Markus Walsh, Africa Soil Information Service (AfSIS), Arusha, Tanzania	This presentation was given by Dr. Sam Gamada from IFPRI on behalf of Dr. Markus Walsh (delegated)
15:40–16:10	Discussion	Participants	
16:10–16:30	Health break	Organizers	

**Session III: Policy and Networking Perspectives****Chairman:** Dr. Tadele G/Selassie**Rapporteur:** Mr. Fanosie Mekonen

16:30–16:45	Fertilizer Policy	Mr. Mesfin Berhanu, Ministry of Agriculture and Natural Resources, Ethiopia	This paper was not presented
16:45–17:00	Land Tenure Policy	Mr. Tigstu Gebre Meskel, Ministry of Agriculture and Natural Resources, Ethiopia	
17:00–17:15	Soil Fertility Research and Outreach	Dr. Tesfaye Shimber, Ethiopian Institute of Agricultural Research, Addis Ababa	This paper was not presented
17:15–17:30	The Role of Professional Associations in Promoting Soil Health and Fertility Management	Dr. Eyasu Elias, President, Ethiopian Society of Soil Science, Addis Ababa	This paper was not presented
17:30–16:15	Discussion	Participants	
18:15–18:30	Reflections on day 1 deliberations	Facilitator	
18:30–20:00	Reception	Organizers	

**Day 2 (6 November)****Session III: Policy and Networking Perspectives cont'd.****Chairman:** Dr. Tadele G. Selassie**Rapporteur:** Mr. Fanosie Mekonen

<b>Time</b>	<b>Topic</b>	<b>Presenter</b>
9:00–9:15	Partnerships, Advocacy and Awareness Creation in Soil Health and Fertility	Yelleke de Nooy, Coordinator, Agri-ProFocus Ethiopia
9:15–9:30	The Role of Higher-Learning Institutions in Promoting Soil Health and Fertility Management Knowledge	Dr. Sheleme Beyene, Hawassa University, Ethiopia
9:30–10:30	General discussion	Participants
10:30–11:00	Health break	Participants

**Session IV: Closing session.****Chairman:** Dr. Sheleme Beyene**Rapporteur:** Dr. Eshetu Bekele

11:00–11:30	Reflections	Individual participants and institutions
11:30–12:00	Workshop Resolution	Participants
12:00–12:15	Closing remarks and vote of thanks	Workshop guest
12:00–12:30	Media briefing	Organizers
12:30–13:30	Lunch and end of Workshop	Participants

**Appendix 2 List of Participants**

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