

# **Institutional Context For Soil Resources Management in Ethiopia: a Review**

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**September 2015  
Addis Ababa**

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## **Acronyms**

ADLI	Agriculture Development Led Industrialization
AEZ	Agro-ecological Zone
AGP	Agricultural Growth Program
ATA	Agricultural Transformation Agency
ATVET	Agricultural Technical Vocational Education and Training
BOA	Bureau of Agriculture and Rural Development
CAADP	Comprehensive Africa Agricultural Development Program
CSO	Civil Society Organization
DA	Development Agent
EIAR	Ethiopian Institute of Agricultural Research
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GTP-I	Growth and Transformation Plan I
MDGs	Millennium Development Goals
MOA	Ministry of Agriculture
MOARD	Ministry of Agriculture and Rural Development
MOFED	Ministry of Finance and Economic Development
NGO	Non-Governmental Organization
PADETES	Participatory Demonstration and Training Extension System
RDPS	Rural Development Policy and Strategy
SDPRP	Sustainable Development and Poverty Reduction Program
SLM	Sustainable Land Management
WFP	World Food Program
WOARD	Woreda Office of Agriculture and Rural Development

## **1. Background**

Agriculture is the most important sector in Ethiopia; it accounts for 46% of GDP, 80% of export value, and about 73% of employment. The sector still remains largely dominated by rain-fed subsistence farming by smallholders who cultivate an average holding of less than a hectare. Although agriculture has a long history in the country's economy, development of the sector has been hampered by a range of constraints which include land degradation, low technological inputs, weak institutions, and lack of appropriate and effective agricultural policies and strategies.

Land degradation in general and soil degradation in particular has since been a serious challenge to sustained food security and agricultural development in Ethiopia. Soil erosion and nutrient depletion are the main forms of soil degradation which put major obstacles to agricultural production and development. Soil degradation is widespread in the country and the highlands where most of the crop farming is undertaken suffer the most. Previous studies (such as by FAO) estimated that about 24 percent of Ethiopia's soil faces moderate to very severe fertility constraints. The country also experiences one of the highest rates of nutrient depletion in SSA. Although estimates vary, the cost of soil degradation in the country is substantial. On the other hand, soil nutrient amendments through improved soil management practices and fertilizer applications are largely inadequate to off-set the deficiencies. Diminution of farm size holdings and increased pressure on agricultural land undermined traditional soil management practices such as fallowing, crop rotation, use of crop residues and manure.

Agriculture in Ethiopia can generally be characterized by limited technological inputs. Farming is largely small-scale and is still being carried out using rudimentary technologies. Such a low level of technology not only condenses productivity but also undermines soil protection from various forms of degradation. Hence, low productivity can be attributed to limited access by small farmers to agricultural inputs, financial services, improved production technologies, irrigation and agricultural output markets and, more importantly, to poor land management practices that have led to severe degradation (MoA, 2010).

During the past several decades, Ethiopia has pursued a variety of strategies and policy actions to deal with the problem of land degradation and enhance the agricultural sector. Nevertheless, as the second largest country in Africa and with extreme high population growth, one of the key questions dominating the policy debate is the doubt for the future development of agriculture given the increasingly small plots which farmers must earn their living (Diao, 2010). ADLI has been designed to promote the use of labor-intensive methods to increase output and productivity by applying chemical inputs, diversifying production, utilizing improved agricultural technologies. Furthermore, the Ethiopian government has introduced an extensive extension program called PADETES through which fertilizer packages, improved seeds and credit facilities are made available to boost smallholder agricultural production. And recently, the country has ventured into

an agricultural transformation agenda where huge investment in research and technology transfer is being undertaken. While government commitment to transform smallholder agriculture is appreciated, there is still much doubt that whether the policy and institutional dynamics could enable to address key challenges of soil and land degradation in the country.

## **2. Objective and Scope of the Study**

The objective of this study is to assess the institutional environment for sustainable soil resource management in Ethiopia. The focus is on the policy and institutional context within which soil research and investment takes place. The assessment is intended to provide information that will support policy development for the implementation of large-scale soil rehabilitation efforts in the country.

The scope of this review is limited to reviewing and analyzing the institutional context within which soils research and investment takes place in Ethiopia. The study mainly focuses on review of national level policy and strategy documents related to agriculture and food security, and it did not look into regional level strategies.

## **3. Methodology**

### ***3.1. Ethiopia: Country context***

With a population of about 90 million, Ethiopia is one of the largest and diverse countries in Africa. The country's bio-physical environment is characterized by a variety of contrasting ecosystems, with significant differences in climate, soil properties, vegetation types, agricultural potential, biodiversity and water resources. It has a diversified agro-ecology which is difficult to precisely define and describe. The country was divided into 18 major AEZs based mainly on temperature and moisture regimes. Recently, the MoA has refined the previous classification and further divided the country into 33 major AEZs. Each AEZ has characteristic crops which some crops could be found across several zones while others may be restricted to only one or two AEZs.

Agriculture in Ethiopia is typically characterized by subsistence smallholder farming. The midlands and highlands are dominated by mixed farming systems where livestock and crop production are almost equally important and highly integrated. In the lowlands, pastoral systems and agro-pastoral systems dominate the farming system and livelihood of the people.

Soil degradation has been a perpetual challenge to agricultural development and economic growth in the country.

### **3.2. Methods**

The methodology used for this study involves desk review of relevant policies and strategy documents on agriculture and food security (see list of policy and strategy documents consulted in Annex I). In addition, semi-structured interviews and discussions were held with selected key informants and experts from relevant Ministries and sector offices (see Annex II). The selection of the informants mainly considers their knowledge of the issue and involvement in the relevant sector offices and departments. A checklist is used to guide the interview and discussions with the informants (see Annex III). The data is thematically organized, analyzed and synthesized.

The succeeding sections of the paper are organized as follows: Section 4 provides brief description of the policy context related to agriculture and food security; section 5 outlines to what extent soil management is dealt with in national policies and strategies; review of the Ethiopian extension systems along with the training and number of extension officers is provided in section 6; section 7 focuses on access to and utilization of inorganic fertilizers in the country; section 8 provides an overview of current government initiatives related to sustainable soil management; and section 8 gives a conclusion.

## **4. Brief overview of Ethiopia's agriculture and food security policies**

Agriculture has since been at the center of policy making in Ethiopia. In recognition of this, the Ethiopian government adopted a set of policies and strategies to address the current and emerging challenges of the agricultural sector. During the past several decades strategies for agricultural development in the country have undergone several changes in terms of focus and major goals (Berhanu, 2012). However, the main goal in this endeavor is to raise productivity and promote commercialization to reduce poverty and food insecurity. The strategies date back to the mid-1960s with the introduction of policies and programs specifically aimed at increasing access to modern inputs and extension services for the country's largely smallholder-based agricultural sector (Spielman et al., 2011).

In the mid-1990's, the government formulated the Agriculture-Led Development Industrialization (ADLI) Strategy which was primarily intended to modernizing the traditional smallholder mode agricultural production and form the basis for industrial development. ADLI is a core policy used for fulfilling the MDGs and achieving the country's vision of becoming a middle income country by 2020. ADLI recognizes agriculture as the main driver of economic growth and development, and hence it is the lead strategy for vision and goals of Ethiopia's agricultural sector. The various strategies and programs designed and implemented under ADLI include:

- a) The Sustainable Development and Poverty Reduction Program (SDPRP);
- b) The Rural Development Policy and Strategy (RDPS);
- c) Plan for Accelerated and Sustained Development to End Poverty (PASDEP); and

#### d) The Growth and Transformation Plan I (GTP-I)

However, ADLI as a strategy has been widely criticized for not being effective in bringing about the anticipated food security and economic growth. This was followed by the Plan for Accelerated and Sustained Development to End Poverty (PASDEP), an MDG-based plan which was implemented between 2005 and 2010. PASDEP signify the government continued commitment to invest in agriculture as a means to end poverty.

Before the advent of PASDEP, an extensive extension program called the Participatory Demonstration and Training Extension System (PADETES) had been implemented, which provides fertilizer packages, improved seeds and credit, as well as information on input use and better agricultural practices to vast majority of smallholders in rural areas (Diao, 2010). The main emphasis was to boost the productivity of small-scale farms through intensive use of chemical fertilizers and improved seeds. Although PADETES has shown significant achievements in terms of increasing the productivity of grains through enhanced use of fertilizers and improved seeds by the farmers, the program has faced several challenges. Limited number of extension staff, sole focus on crop production, disadoption of recommended packages by the farmers, and blanket nature of the packages which disregard local differences were among the major challenges that weaken the performance of PADETES.

However, while there have been great strides in the development of agriculture, productivity remains low relative to potential yields (Davis et al., 2010). Among others maintaining soil productivity is still a serious constraint to enhance productivity mainly due to limited investments in soil and water conservation, poor access to inputs and credit services, and imperfect input and product markets. It is in response to this challenges that most of recent national agricultural development strategies and programs are centered on fertilizer promotion, along with the provision of improved seeds, credit and farm management practices.

Building on the achievements of SDPRP and PASDEP, GTP-I continues to focus on enhancing smallholder farming while promoting a stronger private sector involvement to achieve the MDGs and the country's middle income status by 2020. Furthermore, GTP-I was intended to intensify the use of the country's natural resources to enhance productivity and ensure food security. Increased fertilizer import has been among the main targets of GTP-I to augment soil nutrient losses. The AGP, which is a five-year program, is designed Under GTP-I with the prime objective of scaling up existing best practices and innovations in agricultural production and commercialization with emphasis on natural resource conservation and rehabilitation. Institutional strengthening and improving market access for key crop and livestock products are the main components of the AGP. The program targeted high potential areas (83 selected woredas) in four regions (Amhara, Tigray,

Oromia and SNNPR) based on certain criteria such as suitability for agriculture, potentials for irrigation, access to infrastructure and institutional capacity.

## **5. Soil management in National Policies and Strategies**

Ethiopia experiences one of the highest rates of soil nutrient depletion in sub-Saharan Africa. The estimated annual nationwide loss of phosphorus and nitrogen resulting from the use of dung and crop residues for fuel is equivalent to the total amount of commercial fertilizer being used (MoA, 2010). Soil degradation is one of the major challenges to improved agricultural production and food security in the country. Hence, poverty reduction and achieving food security is among the prime policy agenda of the Ethiopian government. Much hope has been vested on the agricultural sector to provide enough produce to meet the main development objectives of the country. In particular, the government strongly believes in the potentials of raising the productivity of smallholder agriculture through intensive use of inputs (mainly improved seeds and fertilizers), and agricultural extension services. National policies emphasize on these key objectives and the strategies are intended to realize them. However, a key question in this regard is to what extent existing policies and strategies have focused on abating soil degradation and enhancing soil fertility.

PASDEP, a five year plan from 2005/6 to 2009/10, has given a significant emphasis to the development of the agricultural sector in order to build on progresses of the preceding poverty reduction strategies and further accelerate growth and development to end poverty. According to PASDEP, the total cultivated land under crops would increase from 12.28 in 2004/05 to 12.65 million hectares by the end of 2009/10 and total production would increase from 16.7 million tons in 2004/05 to 38.21 million tons by the end of the plan year (MoFED, 2006). The primary strategies devised to meet these targets include cropland expansion and intensification, expanded and efficient input supply, improved rainwater utilization, irrigation development, market and infrastructure development, and capacity building. Emphasis has been given to increased soil fertility amendments and reversing soil degradation. Increased use of chemical fertilizers and compost are the most important strategies planned to maintain soil fertility. Hence, fertilizer supply was planned to increase from 480,000 MT in 2004/05 to 820,000 metric tons by the end of 2009/10, and about 2 million farmers (each producing 2.5 tons) would prepare compost which had a capacity to cover about 1 million hectares of land (MoFED, 2006). GTP-I has also planned to double the supply of chemical fertilizers and set a number of targets related to soil resource management (Table 1).



**Table 1: GTP-I targets related to soil resource management (MOFED, 2010)**

Targets	2009/10	2014/15	%
Supply of improved seeds (Million quintals)	0.56	3.6	542.9
Supply of chemical fertilizers, DAP and Urea ( Mt)	0.83	1.66	100.0
Beneficiaries of agricultural extension services (Million)	5.09	14.64	187.6
Areas under Vertisol development ( Mha)	0.60	3.0	400.0
Acid land treated with lime (ha)	2210	37850	1612.7
Land area rehabilitated ( Mha)	3.21	10.21	218.1
Land area subjected to soil fertility research ( Mha)	0.894	2.82	215.4

Over the past years, the country has been investing in the establishment of soil testing centers and laboratories. A number of soil laboratories have been established in most of the regions in addition to the national soil laboratory in Addis Ababa, which is named the National Soil Testing Center. The soil laboratories widespread in the country provide relevant services to improve the quality of soils for increased and sustained agricultural production. Following the decentralization of the then Institute of Agricultural Research (IAR) in 1993, now EIAR, Regional Agricultural Research Centers were established under the respective Regional BOAs. Most of the regional soil laboratories are based in these centers and primarily focus on supporting soils research in the respective region. Furthermore, a number of universities and institutions of higher learning have a relatively long experience in soils research and are equipped with soil laboratories. Among others, Haramaya University, Hawassa University, Mekele University, Addis Ababa University, and Jimma University are prominent institutions with rich experience in soil research and capacity development.

In 2008, an agreement was signed with donors to implement the SLM program in six regional states; Amhara, Oromia, SNNPR, Tigray, Gambella and Benishangul Gumuz. SLM is one of the major conservation initiatives of the Ethiopian government which is primarily intended to combat land degradation, protect natural resources and restore soil fertility in the country. Coordination and implementation of the project was the responsibility of the MoA through its regional and district level offices. The main components of the project include: watershed management; rural land certification and administration; knowledge management; and support to the agricultural extension service. The project is praised for its significant contributions to deterring soil degradation and improving rural livelihoods. Until September 2013, a total of 110,435 ha of individual farmlands and 99,492 ha of communal lands have been covered by SLM practices.

Natural resource management was also a key issue of PASDEP. Among others, the main natural resources management strategies pursued to reverse soil degradation include sustainable land use and forest development, soil and water conservation, and water management for irrigation development. These strategies were framed within the watershed management approach and soil and water conservation activities at the field and farm scales. Major planned activities comprised of identification and up-scaling of best practices and capacity building of implementing entities at local levels.

Building on the achievements of PASDEP, the GTP emerged with ambitious national targets particularly for the agricultural sector. In this plan, agriculture continued to be the main driver of economic growth and transformation. The agricultural development strategy of the GTP focused on support to the production of high value (marketable) crops, intensified commercialization, and development of large-scale commercial agriculture by focusing on high potential areas (MoFED, 2010). A key strategy pursued to increase the productivity of smallholder farming was through scaling up of the best practices of model farmers. With regard to investments in soil fertility management, the plan has set clear targets in terms of boosting the supply of chemical fertilizers, development of areas under Vertisols, treatment of acid soils, massive land rehabilitation and conservation, and expanding soil fertility research.

In 2009, Ethiopia signed CAADP Compact, which is part of an Africa-wide initiative, to strengthen the relevance of its major development policies, mainly ADLI and GTP-I, for agricultural development and food security. Increasing agricultural production and productivity and reducing degradation are among the four strategic objectives of CAADP Compact. The Policy and Investment Framework (PIF) is designed to operationalize GTP-I and CAADP Compact strategic plans with the principal role of providing a strategic framework for the prioritization, and planning of investments that will drive Ethiopia's agricultural growth and development. Seed and fertilizer supply and soil fertility management are the primary investment areas of the PIF. As soil erosion and land degradation are major causes for low productivity and vulnerability of smallholders, continued dependence on chemical fertilizer together with the use of soil conservation practices and organic fertilizers is inevitable.

### ***5.1. The role of civil society organizations***

Civil Society Organizations (CSOs) represent an important element of the development and transformation of Ethiopia. Agriculture and food security is one of the major, perhaps the dominant, focus of many of the CSOs operating in the country. Over the past years, particularly since 1991<sup>1</sup>, they have implemented a myriad of development programs and projects in the

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<sup>1</sup> 1991 was the year when the incumbent government came to power overthrowing the military government which has not been CSOs friendly.

country. The CSOs have been and are still engaged in activities that include sustainable soil management in their programs and projects. Among others, the CSOs in Ethiopia are recognized for effectively raising the awareness of farming communities towards conserving and properly managing their natural resources, including soils and water (Desalegn, 2008). As part of the various projects they carry out, the CSOs also promote tree planting and physical conservation technologies on hillsides and barren land to deter soil degradation and improve land productivity. They have particularly taken a vital role in promoting participatory approaches to natural resources management in general and soil conservation in particular in Ethiopia. However, outlining the specific and detailed soil management related activities of CSOs operating in the country requires an exhaustive assessment which is beyond the scope of this study. But some of the prominent organizations in this regard include: GIZ; SLUF (Sustainable Land Use Forum); ORDA (Organization for Rehabilitation and Development in Amhara); Agri-Service Ethiopia; Farm Africa; REST (Relief Society of Tigray); and FfE (Form for Environment).

### ***5.2. The role of private service providers***

Sustainable soil management can benefit from the participation of the private sector in terms of knowledge sharing and supply of appropriate technologies. In this regard, the role of the private sector in Ethiopia is quite limited. Information regarding soil fertility, fertilizers and improved soil management reaches the farmers through government structure mainly Woreda level agricultural experts and the DAs. In addition, farmers are organized into a group of six farmers, also known as one-to-five, to build a development army. Leader of the group is supposed to be a ‘model farmer’ who is responsible for coordinating the activities of the five farmers related to farming and natural resource management. However, there is widespread skepticism that the development army is primarily used as a tool to political control. Agricultural extension in Ethiopia provides virtually no space for private service providers. Experience to date suggests that an increasing role of the state will not provide the intended growth stimulus to the agricultural sector (Spielman et al., 2011). Many argue the importance of public-private partnership to foster the relevance and effectiveness of agricultural extension in the country. Frequent restructuring of the extension institutions, high staff turnover, inferior quality of field and technical staff, and inadequate budget for the implementation of the extension system are some of the main challenges the Ethiopian extension system is faced with and use to justify the importance of private sector involvement.

Following liberalization of the fertilizer market in early 1990s, there was a promising prospect for private sector involvement. Private companies have been participating in fertilizer imports and retail constituting for a significant share of the national market. However, this has diminished over the years and has now reached to a point where private sector involvement in the national fertilizer market is almost non-existent; private firms operating in the market went from 33 percent in 1995 to zero in 1999. While fertilizer import is solely undertaken by the government, the cooperatives

are largely involved in fertilizer retail and distribution. The government's move from public-private partnership to public-cooperative monopoly in the fertilizer market is believed to be one of the main reasons for inefficient supply and distribution that is recurring in the country.

## **6. The agricultural extension system**

Ethiopia has a long history of agricultural extension which dates back to the 1950s, prior to the establishment of the Ministry of Agriculture. The agricultural extension service is one of the institutional support services which is believed to play a central role in the transformation of agriculture in the country. Different extension systems have been introduced and practiced in different parts of the country since the 1950s. However, a common feature of all the extension models adopted yet in the country is the focus on transfer of technology that is generated from the research systems in a top-down process.

As farmers in Ethiopia are largely constrained by technical knowledge, agricultural extension will continue to be the main strategy to reach out these farmers to improve agriculture and their livelihoods. Hence, investment in agricultural extension has been a key component of the government's strategy to promote smallholder agricultural growth (Berhanu, 2012). Currently, the Ethiopian extension system consists of four major components; the Participatory Demonstration and Training Extension System, Farmer Training Centers, Agricultural Technical Vocational Education and Training (ATVET) and Institutional Coordination. The MoA is the main government institution responsible for the country's agricultural extension system; it provides leadership and financial and technical support (including training and capacity development at various administrative levels) to the establishment and operation of the extension service. The institutional environment for providing agricultural extension services in the country is diverse. A number of institutions play a key role in providing, directly or indirectly, agricultural extension services to farmers. The Ministry of Agriculture through its Agricultural Extension Department is the leading government institution mandated with agriculture extension service delivery in the country. BOARD at the regional level, Office of Agriculture and Rural Development (WOARD) at the woreda level, and Farmer Training Centers (FTCs) at the Kebele level are the main institutions for agricultural extension service delivery. The semi-autonomous EIAR coordinates the decentralized agricultural research activities at federal and regional research centers, and through higher education institutions.

### ***6.1. Training of Development Agents (DAs)***

Agricultural extension in Ethiopia is carried out at the Kebele level using extension officers. There are three extension officers, also known as DAs in each Kebele specializing in plant sciences/crop protection, natural resources management and livestock production. The DAs are trained in ATVETs located across the country.

The training DAs is intended to produce mid-level agricultural professionals with the necessary skills to assist farmers. The training covers general courses on agriculture, communication and extension. In addition, there are technical courses on crop protection, natural resources management and livestock production. The DAs are also provided with specific courses related to soils which deal with soil properties, soil fertility and agriculture, soil and water conservation, and soil-water-plant relationship. Although inclusion of these courses in the curriculum is very relevant, there is much doubt on the adequacy of these courses to equip the DAs with the requisite knowledge and skills to promote sustainable soil management. In the discussion, the experts at the MoA indicated that the courses lack depth to properly equip the DAs with the requisite courses that help to assist farmers in sustainable soil management. Rather, the training focuses on general issues related to natural resources management (such as Afforestation, Natural area conservation work, Organic fertilizer preparation and Organic Production<sup>2</sup>) instead of technical skills in the areas of soil protection and management. Furthermore, the training is conducted with a generic curriculum to all the DAs with limited consideration to differences in agro-ecology, farming systems and socio-economic attributes of the end users of the extension service. Hence, it is crucial to strengthen the training institutions mainly by revisiting the current curriculum of the ATVET colleges giving more emphasis to practical skills. And the resources allocated to many ATVETs are insufficient to conduct practical education (including training on tractors, combine harvesters, or other machinery, and experimentation with plant and animal breeding materials); to assist students in undertaking practical attachments (by covering their travel and living expenses during long-term attachments in the private sector or with public extension services); and to appoint qualified B.Sc. level instructors with sufficient experience and practical training (Byerlee et al, 2007).

## ***6.2. Number and professional capacity of DAs***

In 2000, the government started to invest in ATVET centers to train DAs charged with carrying out agricultural extension services to farmers. A total of 25 ATEVT colleges, 5 federal and 20 regional, have been established so far and there is sizable public agricultural research system led by the Ethiopian Institute of Agricultural Research (EIAR), and complemented by seven regional agricultural research institutes, all funded and managed by the federal and/or regional governments. The federal colleges report to and are managed by the MOA while the regional colleges are managed by the BOAs or the Ministry of Education through the TVET Commission or TVET Agency. The program of ATEVTs run a three years training to produce middle level work force by admitting people who complete the general education (grade 10) in the Ethiopian education system.

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<sup>2</sup> These are some of the courses included in the ATVET curriculum

The number of DAs was 51,315 in 2010 and has grown to 60,625 which are in duty in 2015<sup>3</sup>. Although the number of trained DAs shows increment, the number of farmers they are supposed to reach is too many for a meaningful delivery of the service. Currently, each DA is expected to reach out about 400 farmers on average. Experiences with technology adoption in Ethiopia indicate that farmers are either reluctant to uptake external recommendations or take some more time to comprehend and implement. Hence, DAs need to spend more time with farmers to properly inform them about technologies and assist them to enhance land productivity, which is practically challenged by the disproportionately large number of farmers. Apart from their main duties, the DAs are expected to engage in additional activities such as distribution of fertilizer, collection of credit and taxes, and other government activities that do not typically fall under the mandate of extension (Davis et al., 2010). Extension effectiveness in the country continues to be measured in terms of targets for physical input use, at the cost of emphasizing the efficiency and profitability of input use, and most extension workers view their role primarily as distributing seed, fertilizer and credit packages, which hampers the provision of technical advice (Byerlee et al, 2007).

### **6.3. Farmer Training Centers (FTCs)**

FTCs are presumed to be the foundations of effective agricultural extension in Ethiopia. Establishment of the centers was started in 2002 and the plan of the government is to establish about 15,000 centers throughout the country. So far, about 8,489 FTCs have been created throughout the country with substantial support from the community. The centers are supposed to provide a range of services, which among others include farmer training and extension services on improved farming techniques (through training courses, exhibits, demonstration farms, field days and farmer-to-farmer extension); market-oriented information and advisory services; meeting and communication facilities; and seed and seedlings of new crops, vegetables, fruit and forage varieties (Nigatu, u.d.). The establishment of FTCs and the accompanying strategy and guidelines suggests the beginning of a strategic shift towards knowledge- based approach to smallholder agricultural development as well as a shift from a sole focus on the transfer of technology (ToT) to emphasis on human resource and social capital development (Lemma et al., u.d)

However, the vast majority of FTCs do not have operating equipment or inputs to pursue typical extension activities on the demonstration farm (Davis et al., 2010). It is also learnt that the FTCs are for the most part used as venues for Kebele meetings and other social activities rather than a learning and knowledge sharing foci for the farmers. The fact that extension agents remain largely conveyors of technical knowledge instead of active community facilitators is widely criticized. An effective extension system should provide a room for farmers to participate in the planning of

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<sup>3</sup> This data is obtained through interviews with the experts at the MOA. Officially documented data on the exact number of DAs in the country couldn't be obtained.

activities to enhance learning, ownership of activities and sustained implementation of the recommendations.

## **7. Access to and utilization of fertilizers**

Ethiopia has taken a series of measures aimed at boosting agricultural productivity to achieve GTP-I and other national development objectives. The Ethiopian government has been promoting increased use of chemical fertilizers for agricultural intensification particularly since the 1990s. With support from the World Bank, the government formed a project to support for fertilizer market development emphasizing on improving fertilizer demand and supply, soil fertility management, and fertilizer policy reform. For fertilizers, specifically, the plan is to increase the adoption of improved technologies and ensure an adequate supply of fertilizer through domestic production and a competitive and efficient fertilizer import and marketing system.

### ***7.1. Access to chemical fertilizers***

The use of chemical fertilizers in Ethiopia dates back to the 1960's. However, until recently, the level of fertilizer application by smallholder farmers remained very low. Since the 1990's, promoting increased use of fertilizers become at the center of most policies and strategies related to agriculture and food security in the country. The mechanism of fertilizer supply in Ethiopia has significantly evolved over the past years where the state has a dominant control in the fertilizer market. Involvement of the private sector has been very slim and gradually overtaken by parastatal companies and cooperatives. Cooperative unions have had credit privileges from the government to import and distribute fertilizers. The cooperatives unions obtain fertilizers directly from the Agricultural Inputs Supply Enterprise (AISE), which coordinates all fertilizer imports to the country and responsible for issuing tenders, and the Unions distribute to the primary cooperatives where farmers have direct access to fertilizers either through purchase or on credit terms. In the absence of a cooperative union, AISE takes responsibility to directly deliver to the primary cooperatives. Access to fertilizer mainly depends on the financial standing of the farmer, either through cash or credit purchase, and there is no preferential treatment of farmers in the supply of fertilizers.

AISE is the sole importer of fertilizers in the country. National fertilizer requirements are estimated by the MoA based on data obtained from each Kebele by the DAs. The supply and distribution of fertilizers is one of the most strictly monitored activities by the government and it's illegal for unauthorized entities to engage in the supply chain of fertilizers. So far, there is no reported evidence of black market activity related to fertilizer supply in the country.

## **7.2. Fertilizer utilization**

Theoretically, fertilizer recommendations base on scientific assessment of soil nutrient deficiencies. In Ethiopia, di-ammonium phosphate (DAP) and urea are the only chemical fertilizers supplied to farmers. The use of these two fertilizer types has shown a steady increase over time; fertilizer utilization increased from 105,000 tons in 1990/91 to 600,000 tons in 2009/10, and Amhara, Oromia and SNNPRS regions consume more than 50% of the total national fertilizer supply (Mulat et al., 1997; Mesfin, 2009). In general, the nationally recommended rate of fertilizer application is 100kg DAP and 50 kg Urea per hectare for cereals (mainly for *teff*, maize and wheat) although actual rates for each of these crops vary. However, farmers don't often comply with the recommended rates mainly due to unaffordable fertilizer prices, timely supply of fertilizer, limited credit facility<sup>4</sup>, and risks associated to unreliable rainfall. For instance, currently about 69 percent of the area cropped with wheat is reportedly fertilized, but applied rates are often less than half of those recommended (Zelege et al., 2010). Although there is significant improvement in recent years in road networks, farmers in remote areas suffer from additional transaction costs and delayed supply of fertilizers which undermines the use of recommended rates. Furthermore, farmers make their own judgment of the level of fertility of their land and accordingly apply an amount which they consider is sufficient.

The supply of only DAP and Urea has limited fertilizer choices of the farmers who cultivate a range of crops under various types of soil nutrient deficiency. Currently a large portion of EIAR resources is focused on testing crop yield response to N and P fertilizers, and regional tailoring of DAP and Urea fertilizer recommendations, as these were the priorities identified based on previous studies (Zelege et al., 2010). Hence, farmers appear to be discouraged by the stagnating, sometime diminishing, yield returns to fertilizer application. Despite a fivefold increase in fertilizer application, national cereal yields have only increased 10 percent since the 1980s, and relative benefits of chemical fertilizer application have decreased over time (Zelege et al., 2010). Though the performance of fertilizers depends on the use of complementary inputs such as improved seeds and soil conservation, farmers happen to excessively depend on fertilizers to improve yields and fail to optimally mix other inputs. Decades of continued government promotion has partly contributed to farmers' over-reliance on chemical fertilizers and limited focus on complementary inputs including traditional soil management practices.

## **8. Current government initiatives**

The problem of soil degradation is well recognized by the Ethiopian government since several decades ago. A number of policies and strategies have been devised which directly and indirectly contribute to deal with the soil degradation challenge. Extensive land rehabilitation programs have

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<sup>4</sup> While availability of credit services is a major constraint to access fertilizers, high interest rates of the credit and short payback periods are among the major constraints to farmer to access and utilize fertilizers.



been underway to restore degraded watersheds and cultivated fields. Apart from decades of land conservation activities, a new initiative which focuses on soil health and fertility has emerged recently by the Ethiopian Agricultural Transformation Agency (ATA)<sup>5</sup>. National level data on soil fertility in the country has remained largely obsolete and fragmented with limited detail. The country had no a centralized source of soil information with adequate coverage and level of detail to guide policy formulation and decision-making. Early efforts through the Ethiopian Institute of Agricultural Research (EIAR) and the National Soil Laboratory had been very limited. Hence, ATA's initiative is primarily driven by recognition of this gap and focuses on four priority areas: EthioSIS; fertilizer blending; sustainable land management program (SLMP); and integrated soil fertility management (ISFM).

In this regard, ATA developed a 5-year Soil Sector Development Strategy and it is endorsed by the MOA (ATA, 2014). The Strategy, which includes the identification of a sector vision, soil-level and systemic bottlenecks, and intervention and implementation frameworks, is moving toward implementation. Some of the recommended interventions identified in the Soil Sector Development Strategy include: the promotion of agronomic practices designed to rehabilitate degraded soils while preventing further erosion; increasing the availability and access to improved soil nutrients needed to help smallholders maximize their growing potential; and the establishment of a comprehensive sustainable land management program.

National level soil data is not only obsolete but also not regionally/locally tailored to precisely amend the deficiencies. Furthermore, available data so far is based only on N and P nutrient levels and yield response; information on other aspects of soil health very scant. Hence, EthioSIS is intended to create a detailed and functional soil fertility map at Woreda level for the whole country to support improved fertilizer recommendations and agricultural policy reforms. So far, about 375 Woredas have been covered with soil fertility mapping and fertilizer recommendations. The soil mapping began in few districts and was later scaled up and it was done by modeling the relevant variables in relation to the soil analysis results determined by wet-chemistry and spectral techniques and other environmental variables called "covariates". The covariates help to explain the landscape and other features of a district and this is used together with the soil analysis results to assess soil nutrient status of individual districts and identify the deficiencies which then is used to determine recommendations.

In addition, the government has realized that increased application of specific fertilizers (DAP and UREA) has not resulted in commensurate increase in crop yields. Hence, fertilizer blending is

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<sup>5</sup> ATA was established in December 2010 by the Ethiopian government to promote agricultural sector transformation by supporting existing structures of government, private sector and other non-governmental partners to address systemic bottlenecks in delivering on a priority national agenda for achieving growth and food security.

sought as a viable option to effectively address specific crop requirements, soil nutrient dynamics and agro-ecological differences. Establishment of physical fertilizer blending plants is already underway which can create blends with up to six nutrients and have the flexibility to change the blending according to specific soil nutrient needs. Apparently, these initiatives emerged in response to a longstanding criticism against blanket fertilizer recommendations that have sustained in the country for the last several decades.

SLMP is among the massive land rehabilitation and conservation effort implemented by the Ethiopian government and its partners, mainly by the MOA and GIZ. The program in its first phase has been primarily focusing on physical and biological conservation measures. Building on the success and experiences of Phase I of SLMP (2008 – 2013), Phase II SLMP intends to shift from soil erosion and land rehabilitation to soil health and fertility which includes intensified ISFM activities. ISFM has long been advocated as a sustainable and cost-effective approach to deal with the problem of soil degradation in Ethiopia, including in SLMP-I. The project is intended to provide a set of soil fertility management practices which include chemical fertilizers, organic inputs, and improved germplasm. These are supposed to be combined with the technical knowledge on how to adapt these practices to local conditions to maximize crop productivity. Nonetheless, the success of ISFM project in the country has been faced with several challenges. The main problems relate to lack of coordination in the generation of locally appropriate technologies and failure in properly communicating farmers how to adapt the technologies to their local situations. Hence, addressing these key issues of implementation would enable effective utilization of the potentials of ISFM technologies to enhance soil fertility.

## **9. Conclusion**

This paper attempts to review the institutional context related to sustainable soil management in Ethiopia by focusing on policies and strategies related to agriculture and food security. Agriculture has been an important sector to national development for Ethiopia and it will continue to be a key sector for the coming years, if not for decades. Although the country has adopted a range of policies, strategies and institutional arrangements to boost agricultural production, the sector still suffers from the detrimental effects of soil degradation which undermines potential productivity and entails huge costs for amending degradation. Investments in soil rehabilitation over the past years have been characterized blanket recommendation of conservation technologies and nutrient amendments based on limited analysis of soil fertility status and nutrient deficiency. Homogeneous fertilizer recommendations has perpetuated for over four decades disregarding changing soil nutrient requirements and agro-ecological differences. Apparently, successive policies have been formulated based on the trust that continued and expansive use of fertilizers would realize productivity increase. Adoption of a national fertilizer promotion strategy and ambitious fertilizer utilization targets set in the country's five year growth and transformation plan (GTP-I) is clear

evidence of continued overreliance on inorganic fertilizers. Agricultural extension officers have been instrumental in convincing farmers to intensify fertilizer use as per the recommendations. Despite all these efforts, yield response to fertilizers could meet expectations and become a disappointment to farmers. This highlights the importance of thinking beyond the use of chemical fertilizers to improve soil fertility and yield performance. While recent activities by ATA to address specific soil nutrient requirements based on analysis of soil nutrient deficiencies is a promising initiative, more emphasis should be given in policies and strategies to integrated soil fertility management to ensure sustainable agricultural production.

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### **Annex I: List of policies and strategy documents consulted**

- Agriculture and Rural Development Policy
- Growth and Transformation Plan (GTP)
- Environmental Policy of Ethiopia
- Ethiopia's Food Security Strategy
- National TVET Strategy
- Ethiopia's Agricultural Sector Policy and Investment Framework (PIF) 2010-2020
- Agricultural Growth Program Implementation Manual, draft report dated June 2010
- A Plan for Accelerated and Sustained Development to End Poverty (PASDEP)
- Poverty Reduction Strategy Papers (PRSPs)

### **Annex II: List of interviewees**

<b>No.</b>	<b>Name</b>	<b>Department</b>	<b>Responsibility</b>
1	Hailu Hunide	SLMP	Expert
2	Tibilets Fitsum	Agricultural Input supply	Expert
3	Yenessh Egu	Agricultural Extension	Expert
4	Mesifin Birhanu	Soil fertility & improvement	Director
5	Birhanu Gezahegn	Training & advisory	Director
6	GebreMichael Meles	ATVET	Head
7	Afewerk Mekeberiaaw	SLMP	Expert
8	Hailemariam Kibiret	EAILAA	Unit Coordinator
9	Addis Negash	EAILAA	Unit Coordinator
10	Dereje Biruk	Agricultural Transformation Agency	Expert
11	Feleke Gezahegn	Ethiopian Seed Enterprise	Expert

### **Annex III: Checklist used for data collection**

- 1) An overview of how soils are integrated into agricultural planning and implementation at the national, regional, district and local levels. Questions to guide the research include:
  - a. Does soil fertility and soil degradation appear in national policy and strategy documents on agriculture and food security? And if so, what steps and implementation plans are proposed to improve conditions in the country?
  - b. Is sustainable soil management a part of the curriculum in the training institutes for agricultural extension officers?

- c. Are there any special government initiatives to address soil fertility or degradation issues (integrated soil fertility management schemes [ISFM]; fertilizer subsidies; PES; special loan schemes, etc.)?; ---- probe this one a bit, since many countries have fertilizer subsidies, go a step further to ask if there is anything beyond subsidies
- d. Do civil society institutions include soil issues in their programs? If so, what and how?
- e. How do farmers get access to fertilizers and information about soil management options?
- f. Are there private service providers for information on soil fertility, fertilizers and information on improved soil management? If so, where?
- g. What fertilizer mixes are available through those in (f)?

2) What are the institutional/political obstacles around improving access to fertilizers and other soil management options? (i.e. resistance to the use of inorganic fertilizer; poor market access/transport networks; black market sales of fertilizers; direction of fertilizer to wealthier clients; dominance of middle men or brokers, unacceptable tradeoffs/failure of soil conserving practices such as Conservation Agriculture or ISFM, etc.).

- 3) What is the level of technical knowledge in
- a) key training institutes and
  - b) rural extension personnel throughout the country? What is the number of extensions agents throughout the country? What is the average number of farmers they serve? What is their expertise? Do they have adequate knowledge of soils to advice farmers? How are they trained and their knowledge updated/enhanced?

4) Is there knowledge of farmer soil management strategies at the level of national training institutes? Is this knowledge, if it exists, fed into the curricula of these institutes? How is the curriculum developed and periodically reviewed?

5) What new and innovative initiatives are active in the country related to delivery of soil information and recommendations to farmers? One Acre Fund, Soil Doc, etc.