AGNES
African Group of Negotiators Experts Support

Policy Brief No. 5
December, 2020

L., Motaroki, E. Omollo, A. Karim, M. Joshua, and G. Wamukoya

Sustainable Land and Water Management under a Changing Climate to Ensure Food Security in Africa

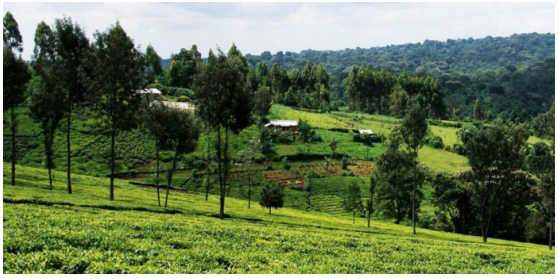

Photo 1: Resilient Landscapes for sustainable agriculture. Source: Sustainable Trade Initiative, IDH

KEY MESSAGES

1. **Adoption rates of SLWM are currently a paltry 8%.**
2. **Acceleration of adoption and scaling up of SLWM requires public and private sector to work together with land owners.**
3. **Significant funding is required to catalyze the adoption of SLWM at the scale required to reverse the level of landscape land degradation.**
4. **Amplify sharing of information and experiences on SLWM through targeted farmers as farmers learn best from other farmers working under similar agro-ecological conditions.**
5. **Enhance integrated landscape planning and management, paying attention to gender.**

Introduction

Land and water are fundamental land-based resources for livelihoods and food security in Africa. Sixty percent (60%) of people in sub-Saharan Africa (SSA) derive their livelihoods from land and its resources. The importance of land to people's livelihood and specifically, food security, is acknowledged in the Sustainable Development Goal (SDG) 2, which aims at eradicating hunger, achieving food security, improved nutrition and promoting sustainable agriculture. This underlies the critical role that land and water resources play in attaining food security and human wellbeing. Regrettably, SSA remains one of the most food insecure regions of the world, hosting about 240 million undernourished people, who account for 29% of the global total of 820 million (Gassner *et al.*, 2019).

The degradation and unsustainable use of natural resources, particularly land and water, undermines the vital role these resources play in agriculture production and rural development across the continent, thus significantly contributing to the persistent and high food insecurity levels. Sustainable Land and Water Management (SLWM) which comprises a suite of technologies and practices is crucial in promoting land, water, biodiversity and environmental management in a manner that ensures their long-term productive potential while sustaining ecosystem services and livelihoods in the phase of climate change.

Status and trends of land resources

The African continent is the second largest in the world after Asia with a total land area of about 3025.8 million hectares (ha). About 22% of Africa's total land area is under forests and woodlands, while 66% is covered by arid zones and deserts (IFAD, 2010), including the world's largest deserts, the Sahara and the Kalahari. Arable land constitutes about 630million ha, representing about 50% of the world's arable land, and supporting majority of people's livelihoods.

African soils fall into 6 categories whereby the first four (Classes I-IV) are generally good quality soils but account for only 10.6% of the total land area and support the largest proportion of the population. The other two categories (Classes V-VI) are of poor quality, highly acidic and frequently waterlogged, making the low-input agriculture upon which over

200 million people depend a challenge. (Figure 1). Wetlands, which cover about 1% of the total surface area in Africa, are important in terms of water recharge, biodiversity conservation and provision of livelihoods. Mountain ranges in Africa serve as the headwaters of some of Africa's largest rivers such as the Nile and Tana Rivers.

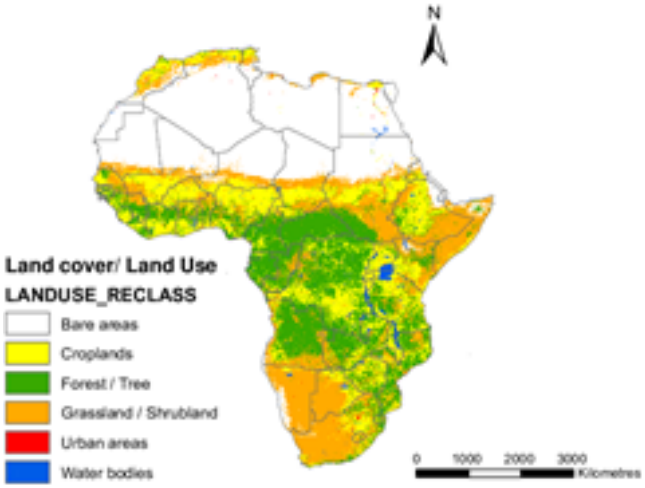

Figure 1: Major land use systems in Africa (Modified from Defourney et al., 2014)

Most of Africa's land resources are experiencing increasing trends in degradation due to overexploitation and poor resource use. Over the last decade, SSA experienced the worst land degradation globally, accounting for 22% of the total global annual cost of land degradation amounting to 300 billion US dollars (Nkonya *et al.*, 2018). The most severe degradation has been encountered on Africa's grasslands where 40% have been degraded, followed by 26% of the forestlands and 12% of croplands.

Status and trends of water resources in Africa

Despite Africa being endowed with big rivers, large lakes, vast wetlands and groundwater resources, it is generally a water scarce continent with only 9% (3931 km3) per year of renewable water resources. About 40% of the population in Africa live in arid and semi-arid areas which have serious water stress and scarcity issues. North Africa is the most water scarce (Figure 2), with just 1% of renewable water resources with abstraction exceeding renewal rates, but hosting 18% of the continental population. The Sahel, eastern and southern regions are water stressed, with close to half (46%) of the total African population and 18 % of renewable water resources. Most of the continent's water resources are located in the Central African sub-region and in the island countries.

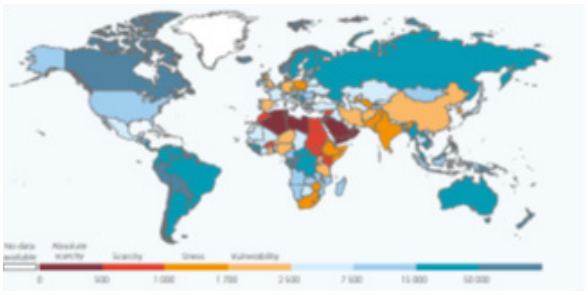

Figure 2: Total renewable water resources per capita (2013). Source: WWAP, 2015

Africa receives an average of 670mm of rainfall per year with great temporal variability (40% around the mean) and spatial variation with North Africa receiving the lowest rainfall. Most of the major river basins in Africa have undergone serious degradation for example the Orange, Niger, Nile and the Lake Chad basin where degradation is characterized to be high to very high (78 to 86%) and the Zambezi and Congo river basins that are less degraded (29 to 24%).

Of the total amount of water withdrawn in Africa, 85% is used in agriculture, 9% for community use and 6% for industry. The total amount of water withdrawn is just 3.8% of IRRs, a reflection of the low level of development and use of water resources across the continent. The volume of groundwater in Africa is approximately 0.66million km3 translating to more than 100 times the annual renewable freshwater resources (0.02km3) and 20 times the freshwater stored in African lakes (0.03km3), an indication of its potential as a driver for development and agricultural production.

Factors influencing the state of land and water resources in Africa

Land degradation

Land degradation is a major problem affecting land and water resources in Africa. Estimates show that about 500,000km2 of land have undergone soil degradation since 1950, and this includes 65% of the continent's agricultural land. The two main processes that lead to land degradation include soil erosion by wind and water and soil degradation through chemical processes such as acidification and salinization, nutrient loss and physical degradation (UNCCD, 2013). Water erosion affects around 227 million ha (around

8% of Africa) while wind erosion affects about 186 million ha resulting in loss of topsoil and soil nutrients. Deforestation and poor agricultural practices are key drivers of land degradation.

Population pressure

Africa's population is the fastest growing in the world, estimated to double by 2050 from the current 1.3 billion people. With an annual rate of 2.52%, these trends place continued pressure on land and water resources and consequently food supply. High population pressure and desire to meet the need of growing food increases land fragmentation and leads to expansion of farming activities into marginal areas and reduction of fallow periods in the gardens thus contributing to land degradation and loss of biodiversity.

Poverty

Over 60% of the people in Africa are engaged in subsistence rain-fed agriculture most of whom are resource-poor. The direct dependence of rural households on climate sensitive sectors such as agriculture and natural resources makes them highly vulnerable to climate-related shocks and natural disasters. The unsustainable use of land resources is exacerbated by lack of pro-poor policies to support the poor.

Land tenure systems

The tenure system is critical in determining how land is used and managed. Insecure land rights among land users in poor rural households in Africa have been shown to be a hindrance to investment in soil, pasture, water, forest and other on-farm resources as the users are not assured of future use and security leading to land degradation.

Climate change

Climate change is altering hydrological regimes. Predictions show a general reduction in precipitation in semi-arid areas, higher variability in rainfall distribution, an increase in the frequency of extreme events, and an increase in temperature. Reduced river base flows, increased flooding, and rising sea levels are projected to affect highly productive irrigated systems dependent on lowland deltas. Droughts and floods are expected to increase affecting the livelihood of the majority of the people who depend on rainfed agriculture. Climate change affects land and water resources by accelerating processes such as land degradation and desertification. The increase in the frequency of extreme events such as droughts and floods, variations in seasonal rainfall patterns, groundwater recharge rate, seasonal runoff regime and inter-annual runoff variability due to climate change and variability affect the state of vegetation cover, biodiversity, soil quality as well as water quality and quantity (FAO *et al.*, 2018).

Institutional and regional policies

The impact of all the aforementioned factors is exacerbated by institutional and regional policies, which shape the complex and interrelated ways that ultimately affect water use, land use and land cover patterns. Policies, property rights and institutions, which are capable of coping with the rapidly increasing demand for land and water resources, are critical for successful adoption of efficient, equitable and sustainable resource use.

At the global level, the United Nations system plays a critical role in promoting international cooperation. Through the three Rio Conventions (UNFCCC, UNCCD and UNCBD) there is a global framework to support scaling up of SLWM. These are complemented by agenda 2030 – the sustainable development goals (SDGs), the 2015 Paris Agreement and the Sendai Framework on Disaster Risk Reduction. At the regional level, the Africa Land Policy Framework; the Abuja and Malabo Declarations; Africa Agenda 2063; the Comprehensive African Agricultural Development Program's (CAADP) pillar 1 and the African Resilient Landscapes Initiative (ARLI) aim to promote SLWM. At the sub-regional level, the Sahel and West Africa Program in support of the Green Wall Initiative is a good example of effective SLWM. Trans-boundary river basin management, sub-regional protocols and river basin authorities have been established.

At the national level, countries have established policies and programs to guide national actions and investments that are aimed at addressing land degradation and protection of watersheds. In addition, there are many programs and projects that are being implemented with the goal of promoting adoption of SLWM practices.

The nexus between land, water and food security

Land and water are the primary resources necessary for agriculture, food production and rural development in Africa. Hence, understanding the complex relationship between land, water and food security is central to addressing Africa's poverty challenge. Despite the multiple uses of land in Africa, smallholder agriculture is the most dominant land use, with farming systems that are mostly rainfed. Africa's arable land is about 27% of the total land area, but there is variation by country such that while arable land accounts for 48.7% and 46.7% in countries such as Togo and Burundi respectively, arable land in Djibouti is just 0.09% of the total land area. An estimated 24% (197 million ha) of the arable land in Africa is under cultivation while the rest remains uncultivated.

In addition, the continent's soils have undergone serious degradation due to a combination of human activities and climate change. Fertiliser use in Africa is also low with only 21 kg (nutrients) per ha of harvested land annually and much lower (9kg/ha of arable land) in SSA relative to 100kg/ha for South Asia, 135kg/ha for east and Southeast Asia, 73 kg/ha for Latin America and 206 kg/ha for developed countries.

Although irrigation has the potential to double Africa's rainfed crop production, many studies demonstrate that it remains underdeveloped and unevenly distributed with wide regional disparities whereby North Africa represents over 40% of the total. The area of irrigated land in Africa is about 13.4 million ha, representing 6% of the cultivated land compared to 157.6 m ha (37%) for Asia Pacific. There is a lag in irrigation development in Africa, with most of the areas that are currently under irrigation scattered all over the continent (Figure 3). Across the region's dryland areas, up to 14 million hectares could sustainably and profitably be converted into irrigated areas.

Figure 3: Key areas where irrigation is used to support crop growth in Africa

Despite having the largest proportion of the world's arable land and a huge irrigation potential, Africa remains among the most food insecure regions in the world. Out of the 821 million people that were food insecure globally in 2017, 31% were in Africa. Although many factors including poverty and climate change contribute to food insecurity, studies show that declining agricultural productivity is attributed to degradation and poor management of land and water resources. For example, in the Sahel, it is the nutrient supply rather than water scarcity that limits crop productivity. **It is projected that the current food production systems in Africa will only meet 13% of the continent's food needs by 2050, considering that population will be more than double the current figures.**

Sustainable Land and Water Management for Agriculture and Food Security in Africa

The concept of sustainable land and water management (SLWM) is defined as *"a knowledge-based procedure that integrates land, water, biodiversity and environment management to provide ecosystem goods and services in a manner that ensures their long-term productive potential while sustaining ecosystem services and livelihoods"*. An important aspect of SLWM is the critical merger of agriculture and environment through maintenance of the long term productivity of ecosystem functions (land, water, biodiversity) and increasing productivity (quality, quantity and diversity) of goods and services, especially safe and healthy food, making it an effective tool for addressing Africa's food security challenges. SLWM uses a holistic approach to achieve healthy and productive ecosystems through the integration of ecological, socio-cultural and economic dimensions.

Principles of best practices in SLWM

The SLWM Community of Practice has resulted in guidelines for sustainable implementation of Sustainable Land and Water Programs. These are:

1. *Community involvement in managing its own resources through participatory programs that facilitate activities of local resource management groups.*

2. *Supporting good decision making based on evidence and reliable information through continuous data collection as well as monitoring and evaluation.*

3. *Provision of incentives for local integrated resource management and removal of disincentives caused by legal or administrative bureaucracies.*

4. *Identification of stakeholders at local, regional and national levels who have responsibility for resource management, decision making or policy setting.*

5. *Multi-sectoral and multi-disciplinary approach to solving the multidimensional problems of land degradation and water management.*

Adoption rates of SLWM in Africa

Estimates show that improving land and water management on just 25% of SSA's 300 million hectares of prime cropland would result in an additional 22 million tons of food. However, despite this potential by SLWM to sustainably feed Africa, adoption rates are still very low with estimates showing that currently only 12.6 million ha (8%) of Africa's total arable land is under managed water and land development.

KEY BARRIERS TO SCALING SLWM

1. Lack of sound SLWM business cases (evidence-based best practice to interest land owners).
2. Lack of adequate policy and institutional human and financial resources for capacity building and extension services (Coordinated planning and collaboration).
3. Lack of awareness of innovative approaches to incentivize adoption of SLWM such as payment for ecosystem services and insurance.
4. High investment risk for individuals and the private sector (De-risking investments in land-based activities).

Opportunities for Sustainable Land and Water Management in Africa

There is emerging consensus that several, interrelated forces drive land management dynamics. The process of fostering uptake of SLWM is quite complex, involving policy, technological and technical options suitable for different conditions. In recognition of this complexity, several global, regional and national efforts have been put in place. Some of the opportunities that could catalyze scaling up of SLWM include:

1. *Land resource potential for agricultural water management*: The potential for agricultural water development is estimated at 46 million ha against 13.4 million ha that are currently developed.

2. *Potential for improving productivity*: Only 25% of the projected growth in crop production is expected to come from expansion of arable land in SSA while 75% will come from intensification in the form of yield increases (62%) and higher cropping intensities (13%). This creates an opportunity to enhance adoption of a suite of SLWM technologies and practices.

3. *Availability of water resources*: Water withdrawals for agriculture are less than 4% of total renewable resources and although major basins in the region are experiencing or approaching water scarcity. Groundwater also has great potential.

4. *Potential for agricultural carbon markets*: Estimates show that in sub-Saharan Africa alone, agricultural carbon has the potential to contribute 17% of the total global mitigation potential (Nkonya et al., 2011). For example, agroforestry has the potential for contributing an additional 10 tons of above and below ground CO2-eq. sequestration/ ha/yr.

PATHWAYS FOR SCALING UP SLWM IN AFRICA

1. Strengthen knowledge management systems and access to information.
2. Increase communication and outreach in ways that amplify the voices of champions and leverage direct engagement with farmers and land owners.
3. Support institutional and policy reforms, particularly for strengthening property rights.
4. Support capacity building, particularly in community-based management of natural resources.
5. Increase support for integrated landscape planning and management.

6. Reinforce economic incentives and private sector engagement.

7. Mainstream investments in SLWM to catalyse adoption of these practices as a strategic component of food security and climate change adaptation and mitigation actions.

Adopted from Winterbottom et al. (2013)

Examples of Best Sustainable Land and Water Management Practices in Africa

Research Studies have documented various best practices and approaches to SLWM that are being deployed and have great potential for scaling up in Africa:

• **Integrated production systems (IPSs):** These are production units that incorporate several agricultural sub-systems such as crops, livestock, aquaculture and agroforestry in such a way that outputs from one sub-system serve as inputs for another sub-system thus avoiding waste of resources. These systems promote poverty reduction by diversifying food production, increasing incomes and minimizing risk and uncertainty.

Photo: Integrated crop and livestock farming. Source: CCAFS

• **Agroforestry:** The integration of agroforestry into farming has also been promoted as a best practice in SLWM. For example, farmer managed natural regeneration (FMNR) is practiced in Niger on close to 30 million hectares. In Kenya, a versatile and productive agroforestry species, Grevillea robusta has become widely adopted in rural landscapes where it is planted by the roadside, field borders or intercropped providing among other things wood and fodder while enhancing soil and water conservation.

Photo: The integration of Grevillea robusta into farming systems. Source: ICRAF

• **Pastoral and livestock management:** Community-based approaches have been used to promote integrated crop-livestock systems in the Sahel leading to improved nutrient use. Pastoral codes and legal texts have been introduced in West Africa to enhance access, sustainability and peaceful use of common pastoral resources. Examples include: the pastoral Charter in Mali and the pastoral codes in Niger and Mauritania. Grazing management strategies that improve range productivity and quality are also being practiced in east and southern Africa such as rotational and deferred grazing management systems. For example, in Tanzania, among the Sukuma people, the *Ngitili* system - a traditional fodder reserve management system for the dry seasons using enclosure systems wherein farmers enclose a piece of land with trees, grasses, shrubs and forbs to increase fodder production and supply of tree products, is practiced.

• **Integrated landscape management:** This refers to the long term collaboration among different stakeholder groups to achieve multiple objectives required from the landscape such as agricultural production, ecosystem services, rural livelihoods, cultural heritage among others. Integrated watershed management (IWM) is one of the approaches that promote ILM whereby the watershed area serves as the spatial integrator unit for managing land and water resources. In many countries the formation of water user associations (WUAs) has been promoted to enhance sustainable and legal use of water resources, safeguard environmental flows to meet downstream ecological demands and livelihood needs, manage/reduce water use conflicts and put in place conservation measures around the catchment area to improve water quality and quantity.

Case Study 1: Organization for the Development of the Senegal River

The governments of Senegal, Mauritania and Mali have established a set of institutions and agreements to enable land- and water-use planning that fairly distributes the benefits of the Senegal River to all. These include the Organization for the Development of the Senegal River, which manages the basin and the Permanent Water Commission, which allocates water rights among Member States and different sectors including industry, agriculture and transport. This cooperation stems from the member states' appreciation of their collective dependence on the functioning river basin.

Gender, youth and Sustainable Land and Water Management

Closing the gender gap in accessing SLWM practices is critical. It is estimated that women comprise more than 50% of the agricultural labour force in Africa. The labour burden of rural women exceeds that of men and includes a higher proportion of unpaid household responsibilities, such as food preparation and the collection of fuel and water. Most policies, programmes and projects frequently overlook the knowledge, tasks, needs and requirements of women and other vulnerable groups (e.g. ethnic groups) in agriculture and water management. For example, a World Bank-funded project worked closely with community groups in Matruh, Egypt to define the needs of women and men and ensure their participation in preparing and implementing local resource management plans. This helped in breaking the natural resource degradation and poverty cycle in the fragile Matruh ecosystem. In Niger, a project implemented by FAO and the World Food Program in the Keita region adopted a gender-sensitive participatory approach that resulted in better understanding of local land use systems and husbandry. The project enabled women to integrate income-generating activities into their agricultural systems such as agroforestry fruit trees and sheep production.

Photo: Women and men working together on a rice field (Source: USAID)

Africa's youth population is expected to continue increasing, with youth expected to account for 75% of the region's total population by 2050. Thus, it is important to create appropriate investment opportunities to make agriculture and the rural economies attractive and profitable to them amidst challenges of landlessness and unemployment. Targeting youth or youth groups and building their capacity can increase their involvement in land restoration and water management activities. However, for youth to make these investments in land and water resources, they need to be incentivized. For instance, under the landless youth for resilient landscapes initiative in Ethiopia, landless youth have been provided with landholding certificates and extension support and in return the youth help in restoring communal lands that are degraded.

Photo: Youth group engaging in tomato farming (Source: Development Connection)

Knowledge gaps in the implementation of Sustainable Land and Water Management in Africa

The following are some of the knowledge gaps that need to be addressed in order to promote sustainable land and water management in Africa:

1. Inadequate **scientific data** showing trends of different land uses in Africa to facilitate proper planning and management.

2. Inadequate **data on current estimates of total land under actual irrigation** for different systems to help identify opportunities for irrigation development.

3. Gaps related to **land** (especially land degradation), **freshwater assessment** (seasonality and economic water stress) and groundwater resources.

4. **Low capacity** in extension services for land and water management and low awareness on the various available SLWM technologies

and their associated benefits to potential users among smallholder farmers.

5. Inadequate **analysis of the adoption of SLWM** by various social groups such as the youth, women and other vulnerable groups.

Conclusion and Recommendations

Experience shows that SLWM can enhance food security and reduce poverty while helping to adapt to and mitigate climate change. These practices can restore the productivity of degraded agricultural landscapes and boost crop and livestock production. But achieving gains at the necessary scale will only happen if tens of millions of smallholder farmers and land owners are motivated to invest in SLWM technologies and practices. During the past 30 years, a wide range of SLWM technologies and practices have been deployed. In this regard, the following recommendations are made:

1. **Create an enabling environment** for main streaming and scaling out sustainable land and water management approaches.
2. **Enhance access** to a reliable and sustainable pool of financial resources (public and private) to support adoption and scaling up of SLWM.
3. **Document and establish a database** of all available SLWM technologies, best practices and lessons learnt to enhance local, national and regional level information and knowledge sharing.
4. **Provide incentives** to catalyse adoption and scaling up of SLWM by land owners and users.
5. **Support capacity building** in SLWM approaches and address knowledge gaps on ecological implications of different SLWM options.

Further Reading

Agriculture for Impact. 2013. Sustainable Intensification: A new paradigm shift for African Agriculture. A Montpellier Panel Report.

George, H., J.-M. Faurès, J. Hoogeveen, G. Franceschini, J. DelaCruz, J. Gault, R. Biancalani, and G. Munoz, 2010: Sustainable options for addressing land and water problems—a problem tree and case studies. SOLAW Background Thematic Report TR15, Food and Agriculture Organization, Rome.

Thaxton, M., Shames S. &Scherr S.J. 2017. Integrated landscape Management: An approach to achieve equitable and participatory sustainable development. Global Land Outlook Working Paper.

NEPAD. 2009. The Comprehensive Africa Agriculture Development Programme (CAADP)
Sustainable Land Water Management: The CAADP Pillar I Framework "Tool" for use by Countries in Mainstreaming and Upscaling of Sustainable Land and Water Management in Africa's Agriculture and Rural Development Agenda.

Nkonya, E.M., Koo J., Kato E., & Johnson T. 2018. Climate risk management through sustainable land and water management in Sub-Saharan Africa. In Climate smart agriculture: Building resilience to climate change, eds. Leslie Lipper, Nancy McCarthy, David Zilberman, Solomon Asfaw, and Giacomo Branca. Part V: Case studies: Farm level response to improving adaptation and adaptive capacity. Pp 445-476. Food and Agricultural Organization of the United Nations (FAO) and Springer.

The World Bank. 2018. World Development Indicators. Washington, D.C.: The World Bank Group. Available from: https://data.worldbank.org/indicator

AGNES
African Group of Negotiators Experts Support

CONTACTS
ICIPE Duduvile Campus, Kasarani
P.O.Box 45801 - 00100 Nairobi, Kenya
+254 759 402 260
info@agnes-africa.org | www.agnes-africa.org

This policy brief was prepared with technical and financial support of the following partners:

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
AUDA-NEPAD AFRICAN UNION DEVELOPMENT AGENCY
Food and Agriculture Organization of the United Nations
THE AGA KHAN UNIVERSITY EAST AFRICA INSTITUTE
African Centre for Technology Studies ACTS Knowledge for Better Livelihoods
IDRC | CRDI International Development Research Centre Centre de recherches pour le développement international
Canada
CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security
CCAFS
ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE
CIAT