CAADP

Sustainable Land and 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

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PARTNERSHIPS IN SUPPORT OF CAADP

The preparation of this framework – led by a joint NEPAD, University of Zambia (UNZA) and Permanent Inter-state Committee for Drought Control in Sahel (CILSS) effort – has built on two earlier undertakings, namely (a) the work commissioned by the TerrAfrica Partnership under the leadership of the United Nation's Food and Agriculture Organization (FAO) and (b) a review led by the African Development Bank, FAO, IFAD, IWMI and World Bank (2007) under the theme “Investing in Agriculture Water for Poverty Reduction and Economic Growth in Sub-Saharan Africa.” A CAADP Pillar I Expert Reference Group provided valuable review input in ensuring that this framework document was tailored to African needs and responsive to advancing the CAADP agenda.

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Abbreviations and Acronyms

AfDB	African Development Bank
AGRA	Alliance for a Green Revolution for Africa
AU	African Union
AUC	African Union Commission
CAADP	Comprehensive African Agriculture Development Programme
CILSS	Comité Permanent Inter-Etats de Lutte contre la Sécheresse au Sahel
CMAWCA	Conference of Ministers of Agriculture of West and Central Africa
COMESA	Common Market for Eastern and Southern Africa
CSO	Civil society organisation
DFID	Department for International Development
ECCAS	Economic Community of Central African States
ECOWAP	Economic Community of West Africa Agricultural Programme
ECOWAS	Economic Community of West African States
FAAP	Framework for African Agricultural Productivity (CAADP Pillar 4)
FAFS	Framework for African Food Security (CAADP Pillar 3)
FARA	Forum for Agricultural Research in Africa
FFS	Farmer field schools approach
FIMA	Framework for the Improvement of Rural Infrastructure and Trade-Related Capacities for Market Access (CAADP Pillar 2)
GEF	Global Environment Facility
GGWI	Great Green Wall Initiative
GTZ	Gesellschaft für Technische Zusammenarbeit
IFAD	International Fund for Agriculture Development
IFPRI	International Food Policy Research Institute
M&E	Monitoring and evaluation
MDG	Millennium Development Goal
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organisation
OAU	Organisation for African Unity
OECD	Organisation for Economic Co-operation and Development
PPP	Public-private partnership
PRSP	Poverty Reduction Strategy Paper
REC	Regional Economic Community
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
RIU	Research Into Use
UNCCD	United Nations Convention to Combat Desertification
UNZA	University of Zambia
SADC	Southern African Development Community
SAKSS	Strategic Analysis and Knowledge Support System
SFI	Soil Fertility Initiative
SLM	Sustainable land management
SLWM	Sustainable land and water management
SSO	Sahara and Sahel Observatory
SWAp	Sector-wide approach

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Executive Summary

The Framework for Sustainable Land and Water Management (FSLWM)

For the past four years, the Comprehensive Africa Agriculture Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD) has worked towards bringing key elements of the CAADP process into this document – the CAADP Pillar 1 Framework on Sustainable Land and Water Management.

CAADP's Pillar 1 aims to extend the area under sustainable land and water management (SLWM) throughout Sub-Saharan Africa. It is one of four continent-wide entry points, or pillars, that CAADP has identified for investment and action in pursuing increased and sustainable productivity in agriculture, forestry, fisheries and livestock management. Founded on the recognition of the importance of SLM and water strategies in the efforts of improving agricultural productivity throughout Sub-Saharan Africa, this document brings together four key elements of the CAADP process:

- Sustainable land management
- Agricultural water development
- Land policy and administration
- CAADP roundtable processes

This framework (FSLWM) builds on two documents – the TerrAfrica Sustainable Land Management Vision Paper for Africa and corresponding Country Support Tool as well as the paper on Investment in Agricultural Water for Poverty Reduction and Economic Growth in Sub-Saharan Africa – which elaborated on a strategic vision for scaling up SLWM in Africa and the practical tools and modalities for pursuing this vision at the national level.

The finalised framework aims to promote partnerships between international, regional, national, district and local/community level stakeholders with the long-term goal of restoring, sustaining and enhancing the productive and protective functions of Africa's land and water resources by combating the interrelated problems of land degradation, food insecurity and rural poverty.

Due to its major contribution to the African economy, the agriculture sector is critical to the success of efforts to reduce food insecurity and poverty. Accordingly, African leaders identified agriculture as a key priority area for intervention in achieving the NEPAD vision, thus, developing CAADP. As such, CAADP is at the heart of efforts by African governments under the African Union/NEPAD initiative to accelerate growth and eliminate poverty and hunger among African countries.

Sustainable land and water management is fundamental to Africa's development

This framework outlines the challenges and opportunities presented by SLWM in Sub-Saharan Africa. As laid out in this document, SLWM recognises that people (the human resources) and the natural resources on which they depend, directly or indirectly, are inextricably linked. Rather than treating each in isolation, all ecosystem elements are considered together in order to obtain multiple ecological and socio-economic benefits. The framework also recognises that SLWM encompasses and contributes to other established approaches such as sustainable agriculture and rural development, integrated natural resources management and ecosystem management.

Land and water are the primary natural resources necessary for agriculture, food production and rural development in most countries. If used in proper association with suitable technologies and related resources, they have the capacity to enable global agricultural production to continue outpacing growing demand despite declining availability of per capita land and water resources. For this trend to take root in Africa and continue elsewhere, increased output must come mainly from intensified production, as new land for expansion is very limited.

In spite of the inherent fragility of Africa's soils, the continent's climatic variability and the uneven distribution and availability of both surface and subsurface water resources, there is substantial untapped potential for the development of natural resources to increase agricultural production. An important element in this is water: Building up soil fertility and the moisture-holding capacity of

agricultural soils as well as rapidly increasing the area equipped with irrigation will not only provide farmers with opportunities to raise output on a sustainable basis but also contribute to the reliability of food supplies.

Land and natural resources are key assets for economic growth and development. Although land may once have seemed an almost inexhaustible asset in Africa, population growth and market development are creating mounting pressure and competition for land resources. Predominantly customary land management systems are under pressure, while formal land tenure and management systems introduced in the colonial period have generally very limited coverage. In practice, land rights claimed and allocated by the modern state often conflict with the land tenure practices of ordinary people. As a result land tenure and shelter are insecure for many Africans, while weak and unclear property rights create a major obstacle to investment.

In addition, land remains extremely inequitably distributed in the former white settler economies of southern Africa, with the majority of rural people excluded from access to the most productive and valuable land. Reliance on land as a principal source of livelihoods and basis for economic development in Africa is likely to persist for the foreseeable future. Reductions in poverty must, therefore, build on the agricultural sector, while clearer structures of property rights can provide a foundation for structural transformation of Africa's economies, which in most cases will need to be led primarily by agriculture.

Today, the land problem is also posed in terms of lack of strong national institutions to undertake the development and the implementation of consensual land policy implying all the actors and taking account of their concerns. Land policy, therefore, needs to secure the rights of all land users and serve the multiple goals of equity, poverty reduction, income growth, economic efficiency and sustainable environmental management.

Strategic priorities

To achieve successful uptake of SLWM, a commitment is required from all stakeholders to make change happen on the ground at a scale that can dramatically and positively influence both land and livelihoods. In parallel, reforms of policies and targeted investments must be made to overcome the barriers and bottlenecks that hinder progress to scaling up and mainstreaming of SLM and water strategies in Africa. This framework identifies bottlenecks and barriers within the following categories: (i) knowledge and technological barriers; (ii) policy, institutional and governance barriers; and (iii) economic and financial barriers.

However, the framework also identifies opportunities for SLWM at the global, regional and national efforts through projects and mechanisms set up by stakeholders such as CAADP, the United Nations Convention to Combat Desertification (UNCCD) and the Global Environment Facility (GEF). Leveraging the efforts of these stakeholders is critical for successful, given that effective SLWM requires multi-stakeholder partnerships to bring together indigenous and scientific knowledge and reconcile different stakeholder interests and needs within the public and private sectors. Furthermore, a multi-sectoral and multi-disciplinary approach is essential as no one agency has all the disciplinary experts required to solve the multi-dimensional problems of agricultural water management and land degradation. Thus, successful implementation depends upon coordination and cooperation in planning and decision-making among different government agencies, especially those responsible for agriculture, livestock, forestry, land and water resources, environment, science and technology, finance, planning and legislation. It is critical that these multi-stakeholder partnerships and multi-sectoral approaches are done at multiple scales, having identified responsibility and accountability supported by integrated programmes, policies and investments within and among African countries.

New and existing SLWM approaches also need to build on lessons learnt. This framework lays out some common elements of successful, namely around: (i) community-based participatory planning; (ii) technology development; (iii) people-centred learning; (iv) cultural and gender sensitivity; (v) decentralised development, (vi) sector-wide approaches and integrated water resources. Important lessons have emerged on crop production and management, pastoral and livestock management, agroforestry and forestry, water and irrigation management, community-based national resource management and farmer learning networks.

Focus on implementation

The heart of the CAADP Pillar 1 Framework lies in encouraging and promoting the movement towards comprehensive Country Strategic Investment Frameworks (CSIFs) for SLWM. Building national commitments and partnerships as well as broad based national coalition stocktaking, analysis and diagnosis of conditions in each country are necessary steps to jumpstarting the process. Next, focus should shift to the formulation of country-specific investment frameworks – to be complete with clear priorities, a preliminary CSIF outline and full costing – as well as actual implementation of the CSIFs.

This document lays out priorities and options for up-scaling SLWM. It includes recommendations on: (i) institutional issues; (ii) policy issues; (iii) development and deployment of technologies; (iv) knowledge management and capacity building; and (v) investments and financing.

Furthermore, it takes into account emerging issues that challenge successful SLM and water strategies. Climate variability and change pose major threats for African countries, especially where there is high dependence of economies and rural people on rain-fed agriculture. The prevalence of poverty and food insecurity coupled with limited development of institutional and infrastructural capacities in most African countries make coping with natural climate variability a perennial challenge. This is being magnified by global climate change, which is predicted by experience some of the most negative impacts. Higher temperatures in most countries in the region cause increased evapo-transpiration, shorter growing periods, drying of the soil, increased pest and disease pressure, shifts in suitable areas for growing crops and livestock and a number of other serious problems for agriculture. Climate change is also expected to cause increased variability of rainfall and increased intensity and frequency of extreme events, including droughts, floods and storms. Thus, concerted and effective responses by governments, civil society, the private sector, communities and individuals are necessary to address the challenges posed by climate change.

Scaling up successful SLWM projects is a challenge that the development community must rise up to meet. This framework concludes that success depends on instituting measures, practices and associated investments that can work synergistically to expand the adaptation and uptake of SLM and water strategies in a rapid and cost-effective manner at higher scales. Mainstreaming serves to support up-scaling, building the SLWM agenda within national and regional priorities which most often occurs through reforms of policy, institutions and finance mechanisms. Such reforms are part of establishing an enabling environment for the long-term. Successful up-scaling and mainstreaming requires that we learn from our past and transcend to our next best thinking.

Lastly, this document spells out the need for the formulation of a monitoring and evaluation (M&E) system for the SLWM and CSIFs. M&E is important for strengthening knowledge management, benchmarking and guiding design and implementation of individual investment operations in SLWM. A system should be designed, starting with the selection of a shared set of measurable and cost-effective goals and indicators, to help guide all related interventions in the SLWM Investment Framework. M&E of project performance has been neglected in the past and needs to be improved in future to inform future strategic planning and project design as well as to measure the contribution of SLWM to achievement of the Millennium Development Goals.

1.0 Background

1.1 Pillar 1 in CAADP process: Objectives and link with other pillars

1.1.1 The CAADP process and its pillars

The New Partnership for Africa's Development (NEPAD) has identified agriculture as central to achieving poverty alleviation, food and nutrition security and attaining the Millennium Development Goals (MDGs) in Africa. The Comprehensive Africa Agriculture Development Program (CAADP) (*including livestock, forest and aquaculture agendas as articulated in the CAADP Companion document*) provides a common framework for stimulating and guiding national, regional and continental initiatives on enhanced agriculture productivity.

Under CAADP, Africa's governments have further identified four continent-wide entry points, or pillars, for investment and action in pursuing increased and sustainable productivity in agriculture, forestry, fisheries and livestock management. These are:

- Pillar 1 – Extending the area under sustainable land and water management;
- Pillar 2 – Improving market access through improved rural infrastructure and trade-related interventions;
- Pillar 3 – Increasing food supply and reducing hunger across the region by increasing small holder productivity and improving the response to food emergencies; and
- Pillar 4 – Improving agricultural research and systems to disseminate appropriate new technologies as well as increasing the support to help farmers adopt them.

Each of these pillars incorporates policy, institutional reform and capacity building and has a framework through which the challenges prioritised by CAADP might effectively and efficiently be achieved.

This document develops the CAADP Pillar I Framework for Sustainable Land and Water Management, with the following documents providing its foundation:

- ***The Sustainable Land Management Vision Paper for Africa and the corresponding Country Support Tool:*** These documents elaborate the strategic vision for scaling up the area under sustainable land and water management in Africa and the practical tools and modalities for pursuing this vision at the national level. The Country Support Tool was developed to ensure clear and concrete linkages between the CAADP agenda and the evolving needs and demands of the country roundtable processes.

- ***The paper on Investment in Agricultural Water for Poverty Reduction and Economic Growth in Sub-Saharan Africa:*** This document identifies key priorities and entry points for approaching the agricultural water agenda through sustainable land and water management.

NEPAD is both a vision and strategic framework conceived by African leaders to address the socio-economic and political challenges plaguing the African continent, namely poverty, underdevelopment and marginalisation. It seeks to achieve its goals by focusing on five key economic sectors: agriculture, human development, infrastructure, agro-industry diversification and development and environment.

Due to its major contribution to the African economy, the agriculture sector is critical to the success of efforts to reduce food insecurity and poverty[1]. Accordingly, African leaders identified the agricultural sector as one of the key priority areas for intervention in achieving the NEPAD vision. The overall

[1] On average agriculture accounts for 30-60 percent GDP, 60-90 percent employment and 25-90 percent export earnings. Second, the majority of poor people in Africa, about 70 percent, live in rural areas and rely on agriculture for their employment and income. Third, Africa's poor spend more than half of their income on food.

performance of the agricultural sector remains weak and fragile, however, prompting African leaders to develop CAADP as the NEPAD framework for the revitalisation of the agricultural sector.

As such, CAADP is at the heart of efforts by African governments under the AU/NEPAD initiative to accelerate growth and eliminate poverty and hunger among African countries. The programme has emerged as a key entry point for both national and international development partner support to the agricultural sector.

Although continental in scope, CAADP is an integral part of national efforts to promote agricultural sector growth and economic development. It is not a set of supra-national programmes to be implemented by individual countries, but rather a common framework reflected in a set of key principles and targets that have been defined and set by African heads of state and government in order to: (i) guide country strategies and investment programmes; (ii) allow regional peer learning and review; and (iii) facilitate greater alignment and harmonisation of development efforts.

These key principles and targets include:

- Agriculture-led growth as a main strategy in attaining targets on food security and poverty alleviation (Millennium Development Goals);
- Exploitation of regional complementarities and cooperation to stimulate growth;
- Application of principles of policy efficiency, dialogue, review and accountability;
- Usage of partnerships and alliances, including farmers, agri-business and civil society;
- Shared responsibilities and collective commitment among the various African institutions -- from the AU institutions (AUC, NEPAD Secretariat and Regional Economy Communities, or RECs) to national governments, civil society and private sector institutions; and.
- Assignment to individual countries the role and responsibility of programme implementation, coordination to designed REC and facilitation to the NEPAD Secretariat.

CAADP marks two key intermediate targets, namely:

- Pursuit of a 6 percent average annual agricultural sector growth rate at the national level; and
- Allocation of 10 percent of national budgets to the agricultural sector.

With the four pillars as its foundation, CAADP efforts drill down to the national level through the “roundtable” process, which focuses on:

- Aligning state policies with regional priorities and the four pillars;
- Exploiting synergies and inclusive discussions on socio-economic bottlenecks and deciding appropriate action on those matters;
- Identifying gaps in the donor funding needed to achieve agreed priorities; and
- Initiating work to monitor and evaluate CAADP’s progress at the national, regional and continental levels.

1.1.2 The CAADP agenda and Pillar 1

Land and water are the primary natural resources necessary for agriculture, food production and rural development in most countries. If used in proper association with suitable technologies and related resources such as labour and investment, these have the capacity to enable global agricultural production to continue outpacing growing demand despite declining availability of per capita land and water resources. For this trend to take root in Africa and to continue elsewhere, increased output must come mainly from intensified production, as new land for expansion is very limited.

In spite of the inherent fragility of Africa's soils, the continent's climatic variability and the uneven distribution and availability of both surface and subsurface water resources, there is substantial untapped potential for the development of the continent's land resources to increase agricultural production. An important element in this is water. The current area under managed land and water development totals some 12.6 million ha[2] equivalent to only some 8 percent of the total arable land,

according to FAO estimates. Substantial public and private investments in developing and improving the management of these resources will be essential to enable African countries to reach the levels of agricultural production required to meet the targets for poverty alleviation, food production and economic recovery by 2015. Building up soil fertility and the moisture-holding capacity of agricultural soils as well as rapidly increasing the area equipped with irrigation will not only provide farmers with opportunities to raise output on a sustainable basis but will also contribute to the reliability of food supplies.

1.1.3 Role, objective and aims of the Framework

The CAADP Pillar 1 Framework has been developed over the past four years. It brings together four key elements of the CAADP process, as follows:

- ***Sustainable Land Management:*** Undertakes to embrace and build on the strategic vision, country support tools and sustainable land management framework developed through NEPAD/TerrAfrica as part of the programme of support mobilised by NEPAD under CAADP and the Environment Action Plan (EAP) to assist countries in scaling up sustainable land and water management practices.
- ***Agricultural Water Development:*** Aims to ensure that issues arising from initiatives led by several key CAADP and TerrAfrica partners are well reflected. This is mainly done through a collaborative initiative involving AfDB, FAO, IFAD, IWMI and World Bank on support to enhance investment and sustainable productivity in agriculture water.
- ***Land Policy/Land Administration:*** Addressing issues related to land policy and land administration is critical to the achievement of sustainable land and water management objectives. The outputs from the work spearheaded by the African Union Commission (AUC) and Economic Commission for Africa (ECA), the Africa Development Bank (AfDB) and various other partners on development of a specific land policy and land administration framework has accordingly been incorporated into the Pillar 1 Framework.
- ***CAADP Roundtable:*** Ensures that the principles and modalities for engagement and integration of sustainable land and water management into the country and regional level CAADP implementation processes (roundtables) is a key element of the Pillar 1 framework itself.

Thus, the role of the framework is to promote partnerships between international, regional, national, district and local/community level stakeholders with the long term goal of restoring, sustaining and enhancing the productive and protective functions of Africa's land and water resources by combating the interrelated problems of land degradation, food insecurity and rural poverty. It will seek to do this through the implementation of a long-term, well-funded and multi-level programme with the short- to-medium term objectives of:

- Building capacity and strengthening the enabling institutional, policy, legislative, budgetary and strategic planning environment for SLM and water strategies; and
- Mainstreaming sustainable land management and water strategies within country-driven programmes to remove the barriers and bottlenecks to financing and scaling-up on the ground, successful technologies and approaches.

The aims of the framework are to provide support for: (i) coalition-building amongst the key stakeholders, regional integration, coordination and partnerships; (ii) empowerment of national and regional stakeholders; (iii) improvement of the collection, management and dissemination of knowledge related to SLM and water strategies; (iv) identification, mobilisation and harmonisation of the investment funds required for the promotion of SLM and water strategies at the local and country levels (and as required sub-regional and regional levels) within nationally determined strategic investment programmes; and (v) scaling up investments and ensuring a more reliable, broad-based and sustained flow of funds for agricultural water.

The framework exists to help countries: (i) review, revise, harmonise and coordinate their efforts at the policy, strategy, technical and programme levels; (ii) expand and consolidate actions that support sustainable land and water management; (iii) benefit from qualitatively and quantitatively increased flows of knowledge, information and expertise to and from members; (iv) better mobilise and channel

financial resources; and (v) provide and obtain mutual encouragement and support in their commitment and efforts towards sustainable land and water management.

1.2 Definitions of sustainable land and water management

1.2.1 Definitions

A number of definitions appear in literature, however for the application of this framework, *sustainable land and water management (SLWM) is considered an imperative for sustainable development and plays a key role in harmonising the complementary yet historically conflicting goals of production and environment*. Thus, one of the most important aspects of sustainable land and water management is the critical merger of agriculture and environment through twin objectives: i) maintaining long-term productivity of the ecosystem functions (land, water, biodiversity) and ii) increasing productivity (quality, quantity and diversity) of goods and services, particularly safe and healthy food.

SLWM encompasses and contributes to other established approaches such as sustainable agriculture and rural development, integrated natural resources management and ecosystem management. It involves a holistic approach to achieving productive and healthy ecosystems by integrating social, economic, physical and biological factors. Thus, it requires an understanding of the following:

- Natural resource characteristics of individual ecosystems and ecosystem processes (climate, soils, water, plants and animals);

- Socio-economic and cultural characteristics of those who live in and/or depend on the natural resources of individual ecosystems (population, household composition, cultural beliefs, livelihood strategies, income, education levels, etc);

- Environmental functions and services provided by healthy ecosystems (watershed protection, maintenance of soil fertility, carbon sequestration, micro-climate amelioration, bio-diversity preservation, etc); and

- Myriad of constraints to and opportunities for the sustainable utilisation of an ecosystem's natural resources to meet peoples' welfare and economic needs (e.g. for food, water, fuel, shelter, medicine, income, recreation, etc).

SLWM recognises that people (the human resources) and the natural resources on which they depend, directly or indirectly, are inextricably linked. Rather than treating each in isolation, all ecosystem elements are considered together in order to obtain multiple ecological and socio-economic benefits.

In addition, there are other definitions for sustainable land and water management many of which indicate the scope and complexity associated with the approach, such as:

At the UN Earth Summit (1992), sustainable land use and management was defined as the foundation of sustainable agriculture and a strategic component of sustainable development, food security, poverty alleviation and ecosystem health. It was referred to as "the use of land resources, including soils, water, animals and plants, for the production of goods and services to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions."

According to the World Bank (2006), SLWM is a knowledge-based procedure that helps integrate land, water, biodiversity and environmental management including input and output externalities to meet rising food and fibre demands while sustaining ecosystem services and livelihood.

1.2.2 Other related approaches to SLWM

The above definitions of SLWM should relate to each country in the context of their application and approach to land and water management. However, there are some additional definitions and approaches to SLWM, namely:

Ecosystem Approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. The ecological approach is used to achieve productive resource management by blending social, physical, economic and biological needs and values to provide healthy ecosystems.

Integrated Natural Resources Management is responsible and broad-based management of land, water, forest and biological resources base needed to sustain agricultural productivity and avert degradation of potential productivity[2].

Integrated Water Resources Management is "a process which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."[3]

Sustainable Land Management is defined, according to the TerrAfrica Partnership (2005), as the adoption of land use systems that, through appropriate management practices, enables land users to maximise the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources. *Land* refers to cropland, range, pasture, forest and woodlands. Land is defined by the UN Convention to Combat Desertification as the terrestrial biologically productive system that comprises soil, vegetation, other biota and the ecological and hydrological processes that operate within the system.

SLM practices include both technologies and approaches applied to raise land quality. The precise practices are usually site specific, allowing project managers freedom in defining what is an SLM technology or practice. For example, tree planting may be an SLM practice in one area but not in another because in the latter instance the practice may negatively affect downstream water availability. *Technologies* refer to agronomic, vegetative, structural, and management measures that control land degradation in the field. Examples include terracing, afforestation, reduced tillage, micro-irrigation, etc. *Approaches* include ways and means of support that help to introduce, implement, adapt and apply technologies in the field. Examples include watershed management, climate risk management and community land use planning, among others.

Agriculture Water Management (AWM) for food production refers to the continuum from rainfall management through to irrigation. It includes field water conservation practices, water harvesting, supplemental irrigation, ground water irrigation, surface water irrigation and drainage. It also considers both development and management of water for food.

1.3 Why sustainable land and water management?

Global water cycle, land management and food security are intimately linked. Land and water remain essential for life and agricultural production.

Feeding a growing and wealthier population in the future will require more food, intensifying the competition for land and water resources. Yet the scope for expansion in cropped or irrigated area remains limited. As the scramble for land and water builds up, intensification in agricultural production will become an inevitable pathway to address the issue. This exerts considerable pressure on ecosystems that provide a range of services to mankind, including food, fiber, timber, fuels, climate regulation, biodiversity conservation and regulation of water flows and quality. Consequently, sustainable land and water management practices remain vital for sustaining agricultural productivity

[2] From ICARDA, http://www.icarda.org/INRMsite/index.htm
[3] From GWP TEC Paper 4

and regional development. By contrast, unsustainable land and water management practices that violate the system's carrying capacity over long periods can impose significant costs in terms of lost opportunities to agricultural production and regional development. In-depth hydrological and economic analyses are needed to shape and guide continental and national vision for sustainable land and water management.

Up-scaling ambitious and successful SLWM projects depends on putting in place measures, practices and associated investments that can work synergistically to expand the adaptation and uptake of SLM and water strategies in a rapid and cost-effective manner at higher scales, as appropriate. This is no small feat. Mainstreaming serves to support up-scaling by building the SLWM agenda within national and regional priorities which most often, occurs through reforms of policy, institutions and finance mechanisms. Such reforms are part of establishing an enabling environment for the long-term. Successful up-scaling and mainstreaming requires that we learn from our past and transcend to our next best thinking.

2.0 Profile and state of land and water resources in Africa

2.1 Land resources

Land and land resources refer to a delineable area of the Earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near-surface climate, soil and terrain forms, surface hydrology, near-surface sedimentary layers and associated groundwater and geo-hydrological reserve, plant and animal populations, human settlement patterns and the physical result of past and present human activity (FAO/UNEP, 1997).

***Africa's land base is environmentally fragile and easily degraded*.** A variety of different land degradation processes (see Box 1) are at work. There is strong evidence that large areas of the croplands, grasslands, woodlands and forests are already seriously degraded.

Box 1: Some of the Key Causes of Land Degradation in Sub-Saharan Africa

Land degradation refers to the reduction or loss of the biological or economic productivity and complexity of land, resulting from land uses or from a process or combination of processes, including those arising from human activities and habitation pattern. These include long-term loss of natural vegetation, soil erosion caused by wind and/or water, deterioration of the physical and chemical and biological or economic properties of soil (UNCCD, 1994).

The most important *natural factors* relate to the risks of:

- Water erosion – steep slopes, high intensity rainstorms, erodible soils;
- Wind erosion – strong winds, semi-arid/arid climatic zones with sparse vegetative cover;
- Soil fertility decline – strong leaching of soil nutrients, rapid decay and mineralization of soil organic matter, weathered acidic soils low in organic matter and soil nutrients;
- Degradation in soil physical properties – weak structured soils low in organic matter;
- Salinization – semi-arid/arid climates with high evaporation rates and low leaching intensity;
- Vegetation degradation – low and erratic rainfall limits vegetative recovery following disturbance; and
- Climate variability - decline in water quality and quantity, alternating abundance and scarcity according to the season (wet or dry), or natural climatic cycle (El Niño/La Niña);

The *direct (human) causes, or pressures* on land include:

- Inappropriate management (shorter fallows, exposed soil, etc) of the land for the cultivation of annual rain-fed, irrigated and/or perennial crops;
- Poor management of natural forest and tree plantation/woodlot areas;
- Removal and degradation of natural vegetation through deforestation and/or overexploitation of local species;
- Overgrazing of natural and planted pastures;
- Poor management and over-use of surface and groundwater resources;
- Poorly planned and managed urban and industrial development (resulting in the physical loss of good farm land, pastures and forest areas as well as on- and off-site pollution);
- Forest fires; and
- Population growth.

The key *root causes or driving forces* of particular importance in Sub-Saharan Africa are:

- Poverty/economic disadvantage (poor people cannot afford to forgo short term production/resource exploitation to take care of immediate income needs for the sake of long term sustainability);
- Lack of awareness of the consequences of land degradation, which happens progressively and with symptoms that are not immediately evident;
- Population pressure leading to small land holding size, in high potential areas, with traditional fallowing practices abandoned as individual plots are of necessity cultivated on a continuous basis;
- High input costs, low produce prices and other market failures are disincentives to investing in improved land management practices;
- The linkage of under- nourishment and ill health, with rural households with food shortages being more susceptible to the ravages of malaria, HIV-AIDS and tuberculosis, which in turn reduces their ability to produce food, or earn livelihoods in off-farm employment;
- Rural households with insecure user rights for their farm plots, pasture and forest resources are less willing to invest in ensuring future productivity, being unsure as to whether they will benefit;
- Inappropriate development policies driven by short term output targets that ignore long term sustainability; and
- Weak or non-existent advisory support services limiting land users' access to improved farm inputs and information on alternative land use enterprises and improved land management practices;
- Vector borne diseases and biting insects and arthropods.

Box 2: **Summary of Land Degradation Status and Illustrative Consequences**

Status of Land Degradation

- Land degradation affects 67 percent of Africa's land area, with 25 percent characterised as severe to very severely degraded and some 4 to 7 percent as non-reclaimable.
- Africa is currently exporting 1.7 billion tonnes of sediment per year, causing productivity losses and contaminated water sources.
- The productivity loss in Africa from soil degradation since World War II has been estimated at 25 percent for cropland and 8 to 14 percent for cropland and pasture together.
- There is a negative nutrient balance in Africa's croplands, with at least 4 million tonnes of nutrients removed in harvested products compared to1 million tonnes returned in the form of manure and fertiliser. Soil fertility degradation is considered the single most important food security constraint in Africa.
- Some 86 percent of African soils are under moisture stress.

Illustrative Consequences

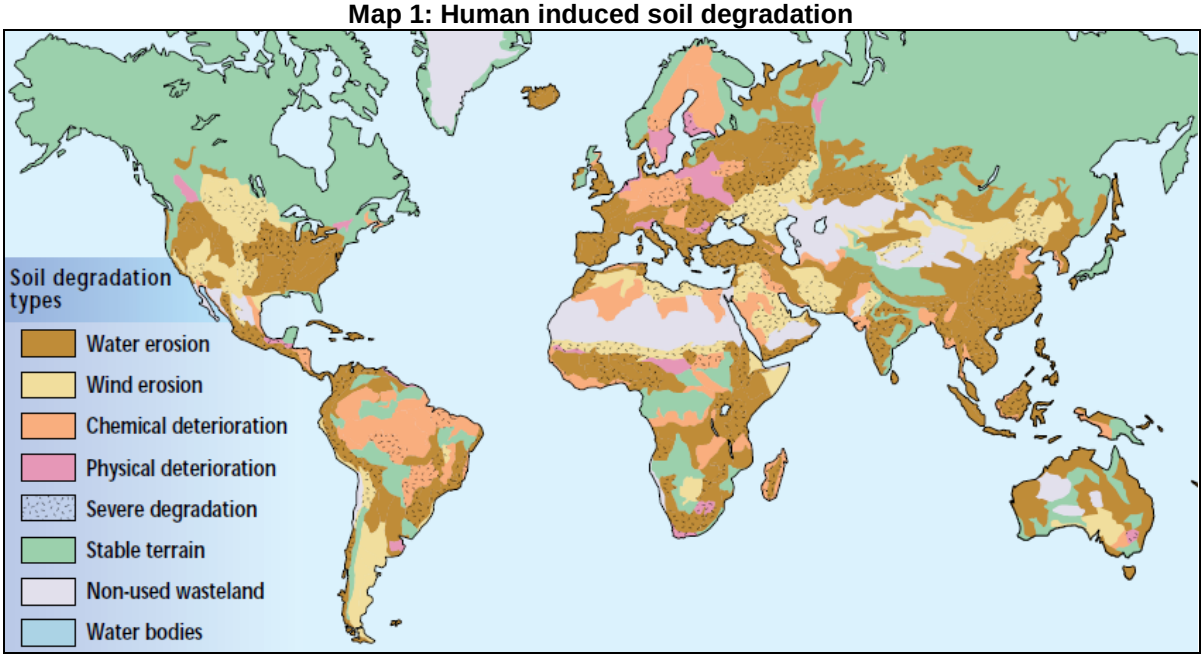
- Over 3 percent of Africa's agricultural GDP - equivalent to US$ 9 billion – is lost annually as a direct result of soil and nutrient loss.
- By 2015, Africa will host half of the world's poor.
- The World Food Programme has spent US$12.5 billion (45 percent of its total investment since its establishment) in Africa and 50 percent in 2001.
- Africa spent US$18.7 billion on food imports in 2000 alone.
- In 2000, Africa received 2.8 million tonnes of food aid-- over a quarter of the world total.
- In 2001, 28 million people in Africa faced food emergencies due to droughts, floods and strife, with 25 million needing emergency food and agricultural assistance.
- Hunger and malnutrition in Africa, coupled with the degradation of water resources, have increased susceptibility to life threatening diseases.
- In Sub-Saharan Africa, 15 percent of the population, or 183 million people, will still be undernourished by 2030 – by far the highest total for any region and only 11 million less than in 1997-99. Malnutrition is expected to increase by an average of 32 percent.
- Land degradation has led to forced migration of individuals, rural households and entire communities.
- Conflicts between settled farmers, herders and forest dwellers over access to land resources have increased as households and communities search for productive land for their crops and/or livestock.

Land degradation is continuing and increasing in severity and impact. If present trends continue, two-thirds of Africa's croplands could effectively be non-productive by 2025 (UN 2004). At the same time the total area and productivity of Africa's traditional rangelands is decreasing.

The GLASOD project (Oldeman, 1994) was the first comprehensive effort to map land degradation globally using standardised criteria[4]. The GLASOD map for Africa (see Map 1) revealed that by 1990 some 67 percent of Africa was affected by slight to extreme land degradation. Evidence of degradation is widespread, with 17 percent of Africa's total land area shown to be degraded to such an extent as to directly affect its productive potential.

[4] GLASOD data is based on "expert opinion" (i.e. the perception of experts on the kind, extent and severity of land degradation in a country or region that they know well) rather than field based measurements.

Map 1: Human induced soil degradation



Source: ISRIC/ UNEP/ FAO, 1996

More recent studies (FAO, World Soils Report, 2000 and TERRASTAT) confirm that evidence of land degradation can be found in about 67 percent of the total land area, or about 16.1 million km^2. This has been further defined in terms of degree of severity into light (24 percent), moderate (18 percent), severe (15 percent) and very severe (10 percent). While the total affected area has not apparently changed since the GLASOD assessment, the area affected by severe and very severe degradation (i.e. negatively affecting production potential) has increased[5].

Soil nutrient depletion in the fields of Africa's small-scale farmers is severe with inadequate replenishment of the nutrients lost due to soil erosion, leaching and removal in harvested products. Nutrient depletion in Africa represents a significant loss of natural capital valued at an estimated US$1 to $3 billion per year. If most of the nearly 70 million smallholder families in Sub-Saharan Africa fail to adopt sustainable integrated soil fertility and land and water management practices on their farms within the next decade, they will seriously jeopardise their long-term food security, productivity and incomes while environmental degradation will accelerate. IFAD reports for Western and Central Africa indicate that land degradation from extensive agriculture, deforestation and overgrazing has already reached alarming levels. About 50 percent of the farmland suffers from soil erosion and up to 80 percent of rangelands are degraded in some way due to over-use.

Box 3: The Dominant Types of Land Degradation in Sub-Saharan Africa

Soil degradation – decline in the productive capacity of the soil resources as a result of adverse changes in their biological, chemical, physical and hydrological properties, which in turn increase the vulnerability of erosion prone areas to accelerated soil loss through both water and wind erosion.
Vegetation degradation – decline in the quantity and quality of the grasses, herbs and woody species found in grasslands, woodlands and forest, combined with a decrease in the ground cover provided by such plants.
Biodiversity degradation – loss of wildlife habitats and decline in genetic resources, species and ecosystem diversity.
Water degradation – decline in the quantity and quality of both surface and ground water resources and increased risk of downstream flood damage.
Climate deterioration – adverse changes in the micro and/or macro climatic conditions that increase risk of failure of crop and livestock systems and impact negatively on plant growth in rangelands, woodlands and forests.
Land conversion – decline in the total area of land used, or with potential to be used, for crop, livestock and/or forestry as a result of land being converted to urban, industrial, mineral extraction and infrastructure purposes.

[5] These aggregated regional figures mask significant differences amongst countries, with Rwanda and Burundi (57 percent), Burkina Faso (38 percent), Lesotho (32 percent), Madagascar (31 percent), Togo and Nigeria (28 percent), Niger and South Africa (27 percent), Ethiopia (25 percent) seriously affected by soil degradation, while the Central African Republic (2 percent) and Equatorial Guinea (1 percent) are virtually free from degradation.

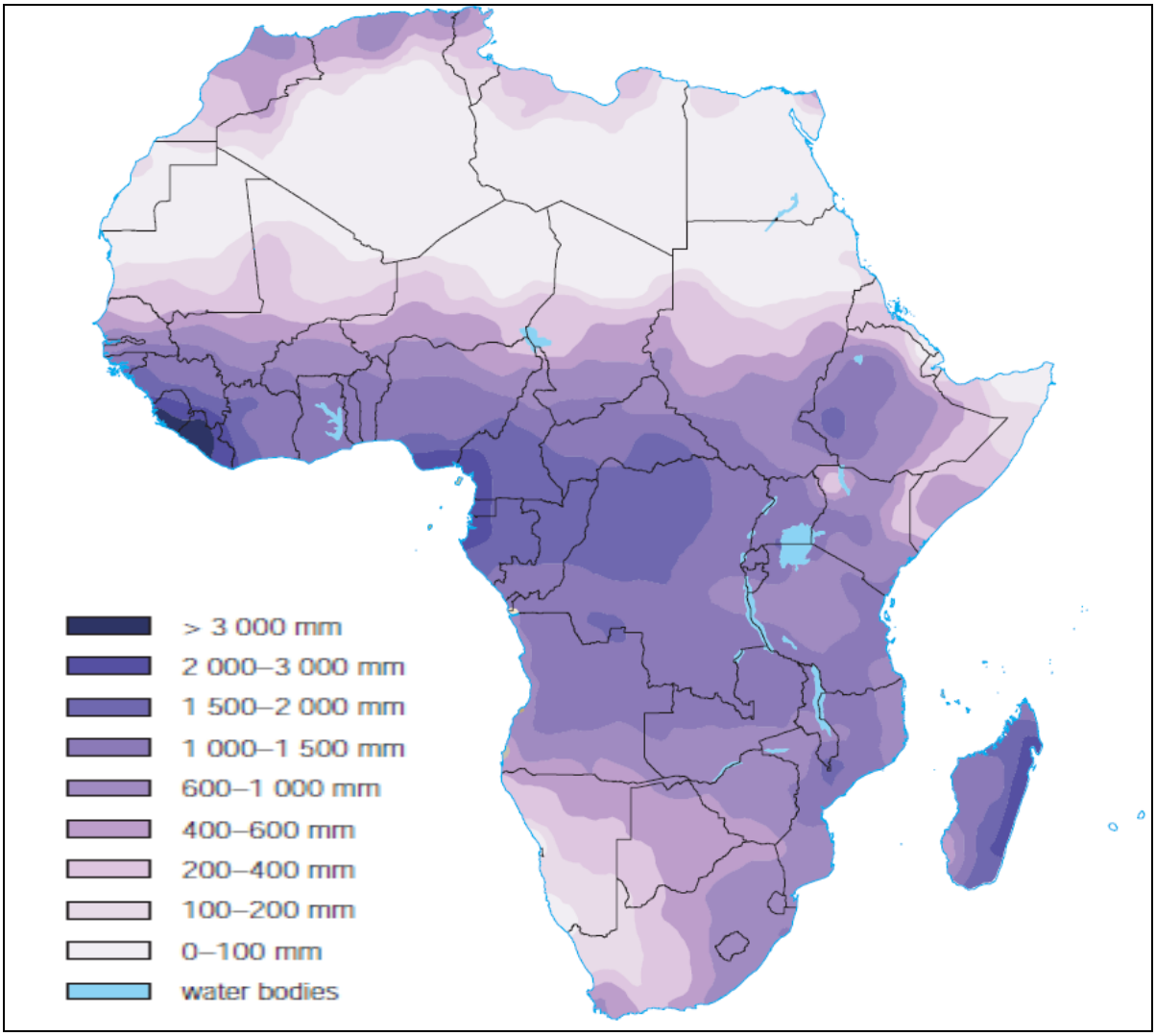
Source: Douglas, 1994

Apart from inefficient uptake of nutrients, the total input of fertilisers is very low. Fertiliser use in Africa is only 21 kg per ha of harvested land per year and is even lower south of the Sahara at 9 kg per hectare of arable land. The corresponding figures are 100 kg per hectare for South Asia, 135 kg/ha for east and Southeast Asia, 73 kg per hectare for Latin America and 206 kg per hectare for industrialised countries.

2.2 Agricultural water

According to the FAO Review of World Water Resources by Country (2003), Africa receives an average rainfall of 678 mm and shares 9 percent of world's fresh water resources (compared to its 13 percent of the world's population and 22.4 percent of the world's land area), with uneven distribution of rainfall. Some areas are receiving either too much rain or too little. More than half of Africa receives less than 500 mm of rainfall yearly (map 2). Most of the countries, particularly in Northern Africa, depend mainly on groundwater as their primary source of fresh water (e.g. Algeria, 60 percent; and Libya, 95 percent, based on UNEP -Africa Environment Outlook, 2002).

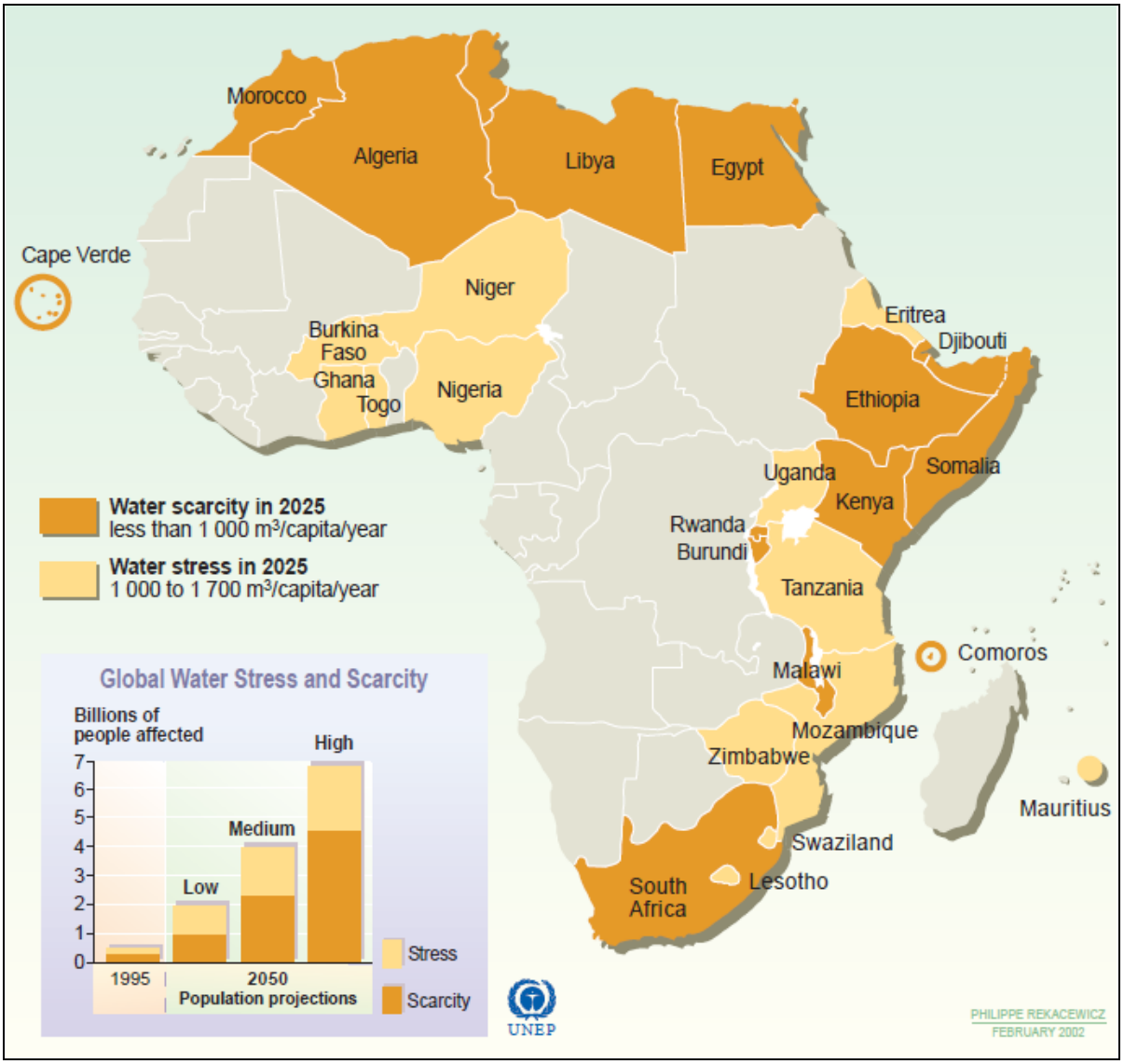
Map 2: Annual rainfall distribution in Africa



Source: UNEP/DEWA/GRID, 2005

Taking into account the population growth perspective, according to Population Action International, more than 2.8 billion people in 48 countries in the world (half of them in Africa) will face water stress or water scarcity conditions by 2025[6]. Map 3 shows which African nations are expected to experience water stress and to face water scarcity by 2025. It also includes a graphic showing that as the world's population continues to grow, a higher proportion of the population will be affected by water stress and water scarcity.

Map 3: Freshwater stress and scarcity in Africa by 2025

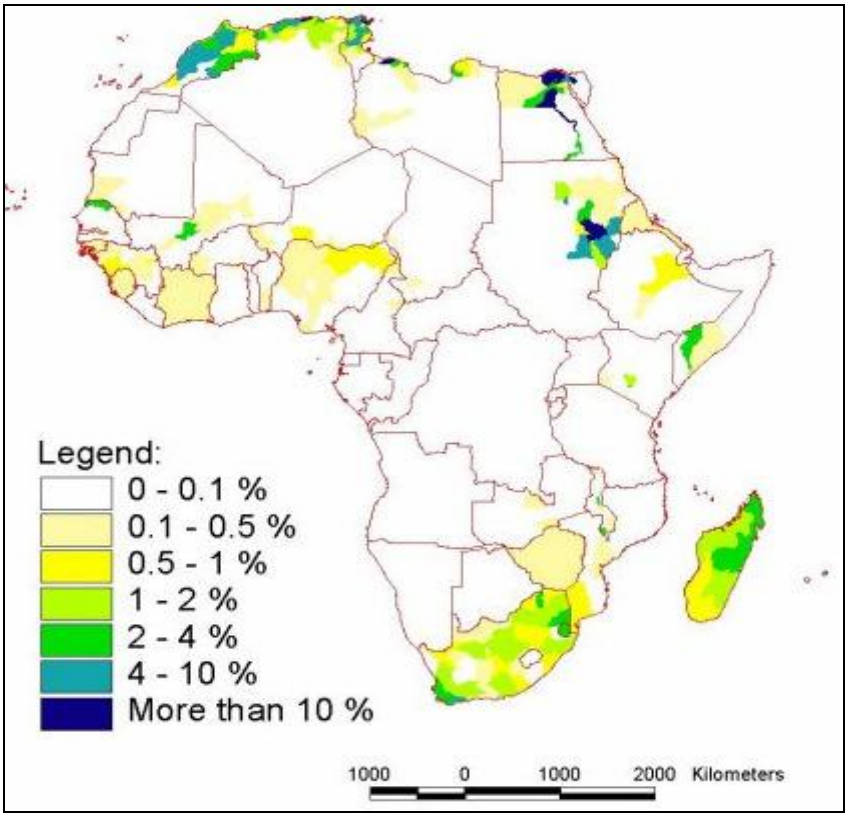


Source: UNECA, GEO, UNEP, Earthscan, Population Action International

Note: Water withdrawals are mainly used for agriculture. Map 4 (FAO 2008) shows where irrigation is the more developed (Northern Africa, Sudan, Madagascar, South Africa).

[6] An area is experiencing water stress when annual water supplies drop below 1700 m^3 per person. Water scarcity means that the annual water supply is below 1000 m3 per person.

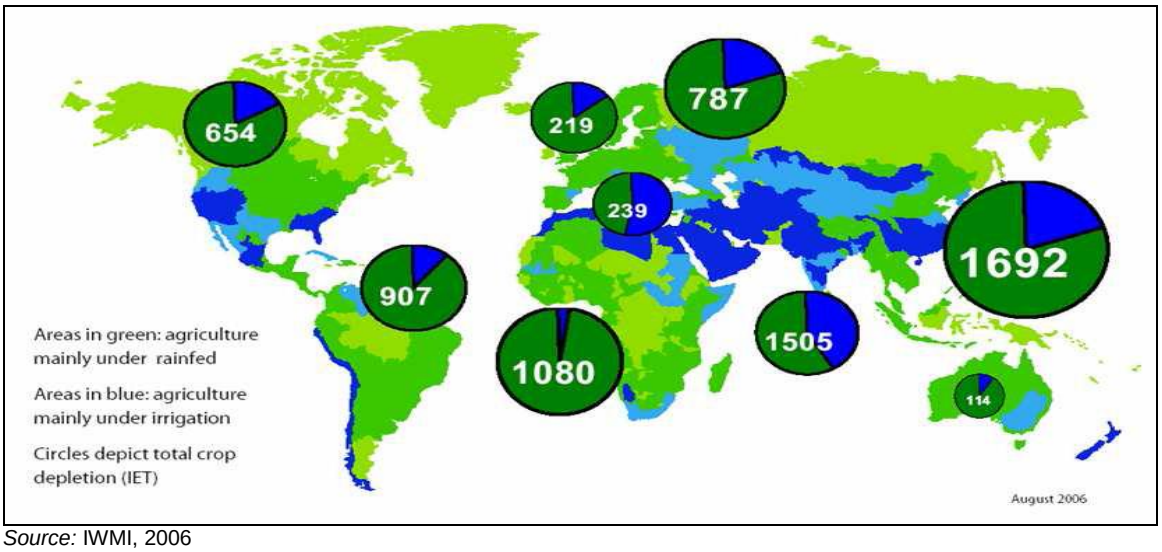
Map 4: Extent of irrigation development in Africa



Source: FAO Aquastat, 2007

Africa accounts for only 2 percent of total annualised irrigated areas worldwide, according to studies done by IWMI using remote sensing in 2006 (Global Irrigated Area Map) and by the Comprehensive Assessment for Water Management in Agriculture in 2007.Although the irrigated area identified seems to have been underestimated due to the accuracy of techniques used, these studies still highlight how little of African lands are irrigated compared to the rest of the world.

Map 5: Continental estimate of land area under irrigation and rain-fed conditions and total crop water depletion using Watersin Model



Source: IWMI, 2006

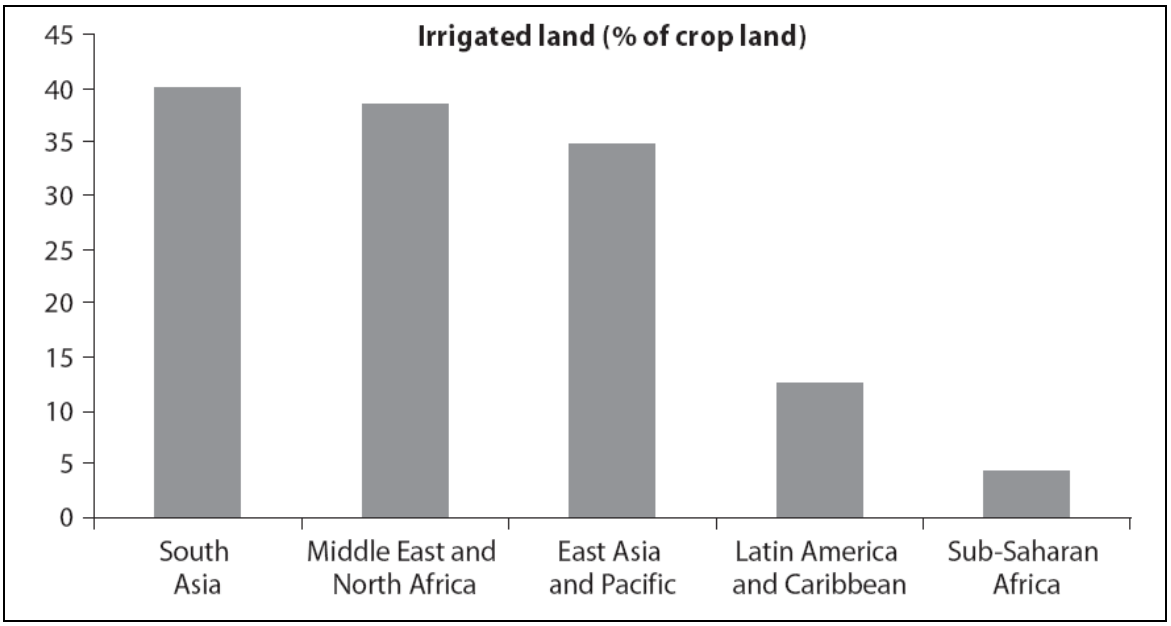
Note: Production refers to gross value of production. The pie charts show total crop water evapo-transpiration in cubic kilometres by region.

The main characteristics of agricultural water in Sub-Saharan Africa can be described as follows:

There has been less agricultural water development to date in Sub-Saharan Africa than in any other region. At just 4.9 percent of the total cultivated area of 183 million hectares, the area developed is by far the lowest of any region of the world (Fig. 1). Three countries – Sudan, South Africa and Madagascar – account for two-thirds of the irrigable area developed.

Expansion of irrigation has been slow. Over the last 40 years, only 4 million hectares of new irrigation has been developed in the region which is by far the smallest expansion of any region. Over the same period, China added 25 million hectares and India added 32 million hectares (FAO, 2003a).

Figure 1: Sub-Saharan Africa has a far lower share of its arable land under irrigation than other regions



Source: World Bank (2005a)

More than 33 million people derive their main income from agricultural water managed areas. Although there is no reliable data, it is estimated that at least 6 million households representing more than 33 million people live directly on earnings from the sub-sector. This number is surely significantly underestimated because AQUASTAT is likely to have under-reported areas under individual private smallholder irrigation (including urban and peri-urban irrigation), micro-scale irrigation (including water harvesting) and "other forms of water management." Furthermore, the estimates take no account of those households engaged in wage labour for agricultural water management, including those employed in large-scale private commercial irrigation.

Water withdrawals for agriculture are very limited, with just under 2 percent of the total renewable water resources. Total withdrawals for agriculture in Sub-Saharan Africa amount to 105 billion m^3, less than 2 percent of the total renewable water resource.

Water storage infrastructure is low. Most countries in the region have low levels of water storage infrastructure, averaging 543 m^3 per capita, compared to 2,428 m^3 in Latin America and well below the world average of 963 m^3 per capita. In Kenya, for example, total storage capacity per capita is only 126 m^3, less than 4 percent of the level in Brazil (based on ICOLD data and on IWMI 2005a, World Bank 2004a).

***Surface water is overwhelmingly the water source for irrigation*.** FAO (2005a) indicates that 90 percent of the area under full or partially controlled irrigation in Sub-Saharan Africa is supplied from surface water. There is a concentration of irrigation directly linked to water courses in the Nile, Niger, Orange, Senegal, Volta and Zambezi river basins.

***Groundwater irrigation is also locally important*.** FAO (2005a) also indicates that approximately 10 percent of the area under full or partially controlled irrigation is supplied from groundwater. However, because groundwater is used extensively by private individual small and micro-scale irrigators, many of whom would not be included in AQUASTAT survey data, the data presented here may be under-estimated.

Large-scale irrigation schemes have generally been developed and managed by governments. Large-scale irrigation schemes have generally been developed by public agencies in several Sub-Saharan Africa countries, particularly Sudan, Madagascar and Nigeria. In these cases, public agencies have been responsible for operation and maintenance, often with little or no recovery of costs from farmers.

Development and management of smaller schemes increasingly involves farmers. Many of the small- to medium-scale schemes are increasingly being turned over to farmer-management, such as in Zimbabwe, Senegal, Mauritania, Niger, Mali and South Africa. In recent years, most small-scale development by the public sector has been done in partnership with farmers and with the understanding that farmers will take over the scheme's operation and maintenance.

The total extent of in-field rainwater management in the region is unknown but adoption is thought to have been limited. In-field rainwater management practices such as minimum tillage and other methods of water conservation farming have been promoted in the region, but details of how widely these have been adopted are difficult to find. Nevertheless, it is known that 7.8 percent of smallholder farmers in Zambia, for example, adopted planting basins in the 1999/2000 season (Hageblade et al., 2003). It was also reported that 97 percent of all households in 27 villages surveyed in one district of Niger in the 1990s adopted planting pits, stone bunds or *demi-lunes* under the Indigenous Soil and Water Conservation in Africa Programme (Hassane et al., 2000).

Cereals – largely rice – are the principal irrigated crop. High-value horticulture and industrial crops — largely cotton and sugar — are also important irrigated crops. Cereals are the predominant irrigated crop in Sub-Saharan Africa, accounting for almost 50 percent of the harvested irrigated crop area. Rice is the principal crop for 25 percent of the harvested irrigated crop area and is especially important in the humid and sub-humid zones. Other irrigated cereals cover 24 percent of the harvested crop irrigated area and include irrigated maize and irrigated wheat. High-value horticulture, roots, tubers and industrial crops — largely cotton and sugar — are also important, covering 33 percent of the harvested irrigated crop area. Fodder production and fruit trees account for 12 percent, largely in southern Africa and mainly in South Africa.

Peri-urban lands are often used for production of vegetables for better market accessibility and higher prices*.*

Yields of irrigated cereals achieved by smallholders are generally low by global standards and have improved only slowly in recent years. In 1997/99, the average paddy yield in Sub-Saharan Africa was 1.6 t/ha, compared with 2.9 t/ha in South Asia and 4.2 t/ha in East Asia. Low yields in irrigated production in Sub-Saharan Africa can be attributed to unreliable water supplies, poor water control and management, low input use, poor crop husbandry and difficulty in accessing markets. The correlation of low irrigated productivity with remoteness from markets is particularly strong, making it a major factor in Sub-Saharan Africa.

***Livestock are an integral part of most irrigated production systems*.** Livestock are important for animal products, draft power and manure in irrigated crop production (IWMI-ILRI, 2005e). Irrigated agriculture also interacts with pastoral systems: crop residues on the Gezira scheme maintain animals during the long trek to the Khartoum market. However, irrigated fodder production is generally not viable in the region. Livestock production in Sub-Saharan Africa depends more on grazing than in other regions of the world. FAO estimate that fodder currently accounts for only 3.5 percent of all crop output in the region (FAO, 2006).

Integrated use of water bodies, construction of dams for irrigation and/or generation of electricity has created surface water bodies and reservoirs*,* globally estimated to be 750,000 km2. Current total aquaculture production from small water bodies could be 7 million tonnes per year, equivalent to 14 percent of total global production, according to FAO (2007). Riparian and private company communities have utilised these water bodies by catching wild fish stocks, in the case of Lake Kariba, Cabora Bassa and Volta. Recently, aquaculture has emerged as the most popular method of raising fish in these water bodies, example of which are the intensive rearing of tilapia in cages on Lake Kariba. Therefore, steps have been undertaken to reconcile water management for fish production. FAO and WARDA (2003) defined integrated irrigation and aquaculture as a strategy to achieve agricultural productivity while improving the financial sustainability of investments in irrigation. Thus, integrated irrigation and aquaculture were adopted as part of integrated inland water resources management programmes aimed at contributing to improved food security in drought-prone West African countries.

2.3 Land administration and governance

Land lies at the heart of social, political and economic life in most of Africa. Land and natural resources are key assets for economic growth and development. Most African economies continue to rely heavily on agriculture and natural resources for a significant share of GDP, national food needs, employment and export revenue. At the same time agriculture, natural resource use and other land-based activities is a major key to livelihoods, income and employment of the majority of Africans, with land as the basis of shelter in urban and rural areas. Land also has major historical, cultural and spiritual significance.

Although land may once have seemed an almost inexhaustible asset in Africa, population growth and market development are creating mounting pressure and competition for land resources, especially close to towns and cities as well as in productive, high value areas. While Africa's predominantly customary land management systems are under pressure, formal land tenure and management systems introduced in the colonial period have generally very limited coverage. In practice, land rights claimed and allocated by the modern state often conflict with the land tenure practices of ordinary people. As a result, land tenure and shelter are insecure for many Africans in both urban and rural areas, while weak and unclear property rights create a major obstacle to investment.

In addition, land remains extremely inequitably distributed in the former white settler economies of southern Africa, with the majority of rural people excluded from access to the most productive and valuable land. Reliance on land as a principal source of livelihoods and as a basis for economic development in Africa is likely to persist for the foreseeable future. Reductions in poverty must therefore build on the agricultural sector, while clearer structures of property rights can provide a foundation for structural transformation of Africa's economies, which in most cases will need to be led primarily by agriculture.

Furthermore, where land has been inequitably distributed, more equitable patterns of land ownership can generate higher levels and broader based patterns of economic growth. The land problem is also posed in terms of strong national institutions able to undertake the development and the implementation of consensual land policy implying all the actors and taking account of their concerns.

Land policy therefore needs to secure the rights of all land users and serve the multiple goals of equity, poverty reduction, income growth, economic efficiency and sustainable environmental management. Securing land holdings provides rural settlers with opportunities to enhance their livelihoods and reduce vulnerabilities, hence alleviating poverty, assuring the resilience of the local community and improving the overall living standards. Securing land holdings has the potential of increasing revenues from property taxes and decreasing inflation by reviving dead capital.

Land policy which recognises and guarantees property rights is essential for the effective use of land as a livelihood resource applicable to market transactions and the accessibility of credit to the poor. In this respect, innovative policy provisions that guarantee equal access to land resources are necessary. This is particularly crucial in respect of the ability of women to acquire and hold landed property in their own right. The protection of property rights is also crucial with respect to the inheritance of land by women and the protection of the inheritance rights of children.

2.4 Crop production, livestock, fisheries (aquaculture) and forestry

Across Africa, the fate of the rural poor is closely tied to the land and water resources they rely on for food, water and economic security. While urban and industrial growth powers the Africa's commercial economy, the rural poor remain dependent on the benefits provided by ecosystems. Land and water resources are the foundation for the agricultural production, fisheries and aquaculture that provide nutrition and income. These resources also support the production of livestock and forest products that provide food, fuel, fodder, and building materials crucial for the livelihoods of impoverished families. At the same time, these ecosystems provide critical services to a wider rural and urban population, including surface and groundwater restoration, regulation of flooding and maintenance of biological diversity, among others.

The livestock, forestry and fisheries subsector together account for about one third of Africa's agricultural GDP, with the bulk generated by the livestock sub-sector. The three sub-sectors contribution to sustainable agriculture is significant both economically and environmentally. Livestock recycle nutrients on the farm, produce output from land that is not suitable for sustainable crop production and provide power for transport. Trees are used to protect crops from wind damage and forests play a critical role in ensuring sustained agricultural production, including animal husbandry and in some instances, fisheries. Agroforestry, a farming system that combines trees, crops and livestock, enables farmers to diversify agricultural production and reclaim degraded land.

Well over 50 percent of Africa's arable land is cultivated under mixed farming (crop/livestock), agro-pastoral and pastoral farming systems, forest-based or coastal artisanal fishing farming systems. In the absence of widespread technological change during the past decades, rapid population growth has led to the expansion of the cultivated area. This has involved mainly the conversion of large areas of forests, wetlands, river valley bottoms and grassland savannah to cropland. Good pastureland is diminishing as the most productive tracts are converted to cultivation. The mobility of pastoralists' herds is further reduced as settlers increasingly cultivate bottom-lands previously available to herders during dry season migration.

The challenge for designing agricultural development programmes in Africa is the wide variation in the situation of sub-regions and countries. Specific interventions must, therefore, recognise as a minimum the available resource base, including climate, soils, water and topography, the dominant pattern of farm and household activities, including field crops, livestock, trees and fisheries. To promote growth in high population density areas, land productivity and enterprise diversification will be important, whereas in low potential and low density areas, technologies that boost labour productivity are required.

Box 4: Assessing freshwater needs for global food production

The amount of water involved in food production is significant and most of it is provided directly by rainfall. A rough calculation of global water needs for food production can be based on the specific water requirements to produce food for one person. Depending on the composition of meals and allowing for post-harvest losses, the present average food ingest of 2,800 kcal/person/day may require roughly 1 000 m^3 per year to be produced. Thus, with a world population of 6 billion, water needed to produce the necessary food is 6 000 km^3 (excluding any conveyance losses associated with irrigation systems). Most water used by agriculture stems from rainfall stored in the soil profile and only about 15 percent of water for crops is provided through irrigation. Irrigation, therefore, needs 900 km^3 of water per year for food crops (to which some water must be added for non-food crops). On average, about 40 percent of water withdrawn from rivers, lakes and aquifers for agriculture effectively contributes to crop production, the remainder being lost to evaporation, deep infiltration or the growth of weeds. Consequently, the current global water withdrawals for irrigation are estimated to be about 2 000 to 2 500 km^3 per year.

Source: FAO, 2003

2.5 Main issues and bottlenecks for SLWM

Problems of land and water management are well recognised and closely linked to poverty reduction in developing countries, most critically in Africa. While there is obvious need for more integrated planning and coordinated resource management responses, these problems cannot be resolved by prescriptive management measures because local conditions, especially in marginal areas, are highly variable. The implication is that solutions must put a premium not only on better integrated planning, but on more engagement of local level public and private decision-makers, improved

knowledge by all actors of options and innovative technologies and better application of this knowledge by resource users. These factors require enabling conditions and tools to support smallholders, knowledge providers and decision-makers to strengthen collaboration across scales of action, from local to regional.

2.5.1 Issues and bottlenecks

To address the simultaneous pressures on land resources – increasing demand for goods and services and unprecedented rates of land degradation – sustainable land management must include *up scaling* of sustainable land and management technologies and approaches and the *mainstreamin*g of an SLWM priority into government and organisations' policies, programmes and ways of working, particularly at the national level.

Although 1.79 million farmers were reported in 2000 as successfully cultivating some 1.91 million hectares of land using various locally appropriate SLM practices and water strategies (Noble, et al 2005), this represents a very small percentage of the total cropped area in Africa (180-200 million hectares). Therefore, there must urgently be put in place a strategy to scale up these and other local level successes in order to have a significant impact on the inter-related problems of land degradation, declining agricultural productivity and rural poverty. However, up scaling rarely happens on its own. It takes a commitment at all levels and among all stakeholders to make change happen on the ground at a scale that can influence dramatically and positively both land and livelihoods. In parallel, reforms of policies and targeted investments must be made to overcome the barriers and bottlenecks that hinder progress to scaling up and mainstreaming of SLM and water strategies in Africa.

Rainfall variability and long-term droughts and floods are more important determinants of African agricultural production as they pose a severe impact on food security. Rainfed food production has little chance to escape the influence of erratic weather patterns. Farmers have to take best bets on rainfall and if the bet fails, the harvest is at risk. Inputs in rainfed farming are thus kept low, fertiliser use is minimal and productivity is marginal.

The arid Sahel region has been most affected by the changes in rainfall patterns, owing to a fall of 20 to 30% in expected rainfall between 1931-60 and 1961-90 (Hulme, 1996) and more unpredictable seasonal distribution. The droughts of the 1970s and 1980s led to large-scale migration of crop and livestock farmers towards the south in a search for areas with more ample water. This led to the clearing of many areas of forest land in coastal and savannah regions, as well as the displacement of a large number of farmers in heavily populated regions towards less densely populated areas, in a search for land.

Worth noting is the fact that in spite of the new measures to minimize the impact of drought, such as developing crop cultivars, animal breeds that are drought-tolerant, and expanding the area under irrigation. However, the recurrent droughts in sub Saharan Africa are expected to continue to influence yields for another decade or more.

2.5.2 Key barriers and bottlenecks

Bottlenecks and barriers can occur at multiple levels and tend to fall within one of the following categories:

Knowledge and technological barriers: Although a wealth of information exists on successful SLWM technologies and approaches, there is insufficient sharing of experiences at the local, national and regional levels in Africa. There are also still many knowledge gaps, particularly on the economic and financial aspects of SLWM, due in part to inadequate monitoring and evaluation systems. Also, many existing knowledge bases are not readily accessible to all stakeholders, have institutional biases, typically contain macro-scale data insufficiently detailed for planning local level interventions and are largely passive systems with few mechanisms for interactivity and updating from the local level.

Policy, institutional and governance barriers: While there are many achievements, land degradation and SLWM issues are not yet properly understood, internalised and prioritised in country poverty reduction strategies, public expenditure frameworks and sectoral development policies. Most current legislation relevant to land degradation, SLM and related water strategies lack the essential legal and institutional elements needed to: (i) influence, establish and implement market and trade policies that are economically beneficial and promote the sustainability of the land are tied to investments in SLWM; (ii) provide secure individual and/or communal land user rights to provide incentives for SLWM investments; (iii) develop effective long-term land management programmes and targets that address root causes of ecological problems; and (iv) establish socially acceptable mechanisms for encouragement and/or enforcement. Additional challenges are presented by: (i) the lack of sustained political commitment to address the most difficult policy challenges, arising from past legacies and in dealing with emerging and contemporary challenges; and (ii) inadequate human and institutional capacity to design and undertake policy development and subsequent implementation. African countries generally lack land policies that regulate the allocation of high value arable land between competing uses of land such as food production and agriculture, speculative holdings, agro-fuel land uses, infrastructural and others.

Economic and financial barriers: Financial resources available for SLWM and to the agriculture and rural sectors in particular are not commensurate to the needs. Current trends are not encouraging and champions are needed to turn this around. In general, the overall external assistance to agriculture during the last decade has dropped from US$ 3.3 to1.9/ha (1989-2000). In the last five years, only US$ 0.06 to 0.11/ha (of total Africa land area) has been invested in combating land degradation, which is surprisingly low when compared to the cost of the land degradation and to the budget of the agricultural sector. In addition, inappropriate economic and pricing policies have resulted in unsustainable pressures on land resources while effective incentives for SLWM have not been developed and/or are very insufficiently applied. Poverty and lack of financial incentives or credit forces many land users to pursue short-term coping strategies rather than investing in long-term sustainability. As a conclusion, achieving SLWM requires a drastic shift in emphasis.

Up scaling can only be advanced in any meaningful way if the main bottlenecks that prevent SLWM adoption are unlocked. To clearly understand specific bottlenecks in a given context, a participatory diagnostic approach must be carried out to clarify priority areas and ensure that investments remove the major constraints to achieving the desired results.

2.5.3 Up scaling and mainstreaming through a dramatic shift in emphasis

Up-scaling is dependent on putting in place measures, practices and associated investments that can work synergistically to expand the adaptation and uptake of SLWM in a rapid and cost-effective manner at higher scales, as appropriate. This is no small feat. Mainstreaming serves to support up-scaling by building the SLWM agenda within national and regional priorities which most often, occurs through reforms of policy, institutions and finance mechanisms. Such reforms are part of establishing an enabling environment for the long-term.

2.6 Challenges and opportunities for SLWM

2.6.1 Challenges

About 65 percent of Africa's population is affected by land degradation and more than 3 percent of agricultural GDP is lost annually due to soil and nutrient loss. Around US$4 billion a year is also lost due to soil fertility decline and environmental degradation, which contribute significantly to food insecurity in Sub-Saharan Africa. Past experiences in trying to tackle these challenges reveal that policy support and willingness, effective participatory approaches and substantive investments in SLWM are insufficient in reversing these numbers.

The main challenges related to land and water management in Africa can be classified into shifts related to technology, development approach, institutions and governance and policy, as identified below:

Technological shift:

- Consideration of land degradation in terms of why it is happening and tackling the root causes;
- Focus on prevention, protection and enhancement of the ecological functions and services of individual ecosystems;
- Improvement of holistic integrated SLWM approach that uses the full range of human and natural resources and synergistic combinations of technical options to restore, sustain and enhance the productivity of individual ecosystems;
- Improvement of landscape level change through scaling up successful technologies and approaches;
- Development of conservation agriculture based cropping systems involving; (i) reduced or zero tillage; (ii) permanent soil cover (crop residues and/or cover crops); (iii) crop rotation; and (iv) balanced plant nutrition using a combination of organic and inorganic inputs; and Promotion of traditional pastoral systems involving opportunistic, flexible utilisation and planned grazing of heterogeneous rangeland resources.

- Improvement of water control and its efficient use: In semi-arid and arid regions, food production faces a common challenge: rainfall variability and unpredictability. Insufficient soil moisture is the main reason for erratic yields and a major constraint for crop or animal productivity. Droughts or dry spells threaten the survival of crops, forage availability for animals or their watering possibilities. The risk for farmers or herders is high as is their vulnerability. Matching water supply and demand is crucial; water control and efficient use of water are essential for crop productivity.
- Increasing water productivity at all levels and in all sectors: For food production, this means growing more food without adding more pressure on the environment. Making the best use of the available land and water requires innovative methods built on traditional wisdom. Expectations on water savings must be realistic and the effects of water harvesting or land management changes on other users have to be taken into consideration.
- Improving access to low-cost water management technologies that smallholders can use to improve their incomes and escape poverty: Low cost technologies such as micro-irrigation and treadle pumps have considerable potential where conditions are favourable and markets exist for input materials as well as for the output products.

Development approach shift:

- Development of a people-centred learning approach through which land users are enabled to learn about and investigate for themselves the costs and benefits of alternative SLWM practices;
- Facilitation of community-based participatory issue identification and planning building on rural people's inherent skills and capability to formulate and implement their own development plans and to develop and disseminate their own SLWM technologies; and
- Adoption of cultural and gender sensitive approaches that actively involve women, youths and other marginal groups in the planning and implementation of community level natural resource management plans.

Institutional and governance shifts:

- Alignment along a common vision of SLWM implementation strategies through multi-stakeholder (donors, policy makers, private sector and civil society) consensus negotiation, coherent decision-making and multi-level national strategic investment frameworks;
- Promotion of a cross-sectoral and multi-stakeholder strategic partnerships and pivotal champions co-creating strategies, programmes, investment frameworks to remove the barriers and overcome the bottlenecks to promoting SLWM;
- Expansion of the knowledge base of documented best practices and lessons learned through the development of effective local, national and regional level knowledge sharing mechanisms operating within and between African countries;
- Satisfaction of land and water users needs for technical advice, credit, seasonal inputs, equipment and produce markets met by a partnership of local decentralised government,

private sector and civil society agents with enhanced participatory process and technical skills and operational capacity to provide effective advisory support services;
- Achievement of secure access to land for farmers and the urban poor as the basis for improved livelihoods and food security;
- Development of strong public sector and administrative institutions that are responsible and transparent, as well as legal frameworks and regulations which encourage and protect civil society; and
- Development of land administration that is free of corruption and discrimination and is instead transparent, accountable and inclusive.

Policy shifts
- Formulation of effective cross-sectoral policy analysis and design that result in transformative policies that both address root causes of land degradation and result in win-win solutions;
- Mainstreaming of SLWM within and across national strategies and sectoral policies, laws/regulations on agriculture, trade, market, research, land tenure, public expenditure frameworks and across development agencies for successful development strategies and programmes;
- Development of rapid-enabling innovative financial incentives – including mini-grants and other market mechanisms – to facilitate and encourage private investment in on-the-ground SLWM;
- Revision of incentive-oriented legislation containing the essential legal and institutional elements needed to recognise ecological problems and opportunities to develop effective land, water and ecosystem management programmes and targets and establish socially acceptable mechanisms for their enforcement; and
- Provision of a sound basis for secure property rights, for investment and generation of economic opportunities, conflict prevention and peace building with a view to ensuring peace and security.

2.6.2 Opportunities

2.6.2.1 Land

Several global, regional and national efforts have been put in place to address these issues, including:
- ***The United Nations Convention to Combat Desertification (UNCCD)*** motivated by global concern, especially amongst African countries, to address the problem of land degradation, was signed in 1994. In Africa, (i) at the national level: With the technical support of the CILSS, most of the countries of West Africa (15 out of 17) now have a national action plan; and (ii) at the regional level: A sub-regional action plan for West Africa and Chad was adopted in 1999. Its implementation is led by a committee with CILSS as technical Secretariat and ECOWAS at the Presidency.
- ***The Soil Fertility Initiative (SFI)*** launched during the 1996 World Food Summit was the first regional level attempt toward reversing the detrimental effects of soil degradation and nutrient depletion.
- ***The Global Environment Facility (GEF)*** designated land degradation as one of its focal areas at the Second GEF Assembly held in Beijing (October 2002). This was in response to growing global concern over the issues of desertification and deforestation. In 2003, the GEF was designated a financial mechanism of the UNCCD.
- ***The Comprehensive Africa Agriculture Development Programme (CAADP)*** launched in 2002 by NEPAD as an African-led commitment to address issues of growth in the agricultural sector, rural development and food security.
- ***The Action Plan of the Environment*** also launched by NEPAD in 2003 as an integrated action plan designed to address environment challenges whilst combating poverty and promoting socio-economic development.
- ***Regional Economic Communities (RECs) of the African Union*** – which by 2005 along with their member countries took ownership of the implementation process within CAADP – identify priority investment programmes and immediate actions and agreed upon basic principles and procedures for implementation and governance involving also farming and agribusiness stakeholders.

- **The Alliance for a Green Revolution for Africa (AGRA)** is a recently established organisation focusing on a prosperous agricultural system taking into account the economic, social and environmental aspects required to double or triple farmers' yields.
- ***The Great Green Wall Initiative (GGWI),*** an effort of His Excellence Olusegun Obasanjo, former President of the Federal Republic of Nigeria, whose principle of implementation was adopted by the 7th ordinary session of the Conference of the Leaders and Heads of State of the CEN-SAD (Ouagadougou, June 2005). The goal of the programme is to promote a socio-economic development of the target zones vulnerable to desertification by implementing projects of conservation and restoration of the natural resources and promoting economic activities (agricultural, livestock, fishing, handcraft industry, etc). The programme carried out a series of activities, including: (i) a preliminary study defining the concept carried out by the General Secretary of the CEN-SAD and the development of a project of action plan 2008-2010 in collaboration with the Sahara and Sahel Observatory; (ii) a reflection of definition of the concept of the programme realised by the Commission of the UA; and (iii) a reflection of definition of the programme carried out by an ad hoc committee of experts controlled by Senegal.
- **Framework for Improvement of Environment (PCAE)** of the UMEOA, adopted in 2006.
- **Regional Action Programme** of reduction of vulnerability vis-à-vis the climate changes in West Africa adopted in 2008.

2.6.2.2 Water

Availability of water resources: Water withdrawals for agriculture are less than 3 percent of total renewable resources and although a number of basins are currently experiencing and/or approaching water scarcity, that is caused by lack of storage and institutional management capacity (by trans-boundary organizations using IWRM approaches) rather than absolute scarcity.

Land resource potential for agricultural water management: The potential for agricultural water development is estimated at 46 million hectares, yet only about 13.4 million hectares have been developed. This represents only 6 percent of the total cultivated land (221 million hectares), which remains very low in comparison to other regions, such as 20 percent in Asia.

Potential for improving productivity: There is potential for improving the productivity of the 5 million hectares currently under irrigation in Africa through better water supply and management, more input use, better crop husbandry and market access improvement. There is also potential in bringing back into production the 2 million hectares of land that is equipped for irrigation but currently unused. Moreover, water control on the 2 million hectares of land under 'other forms of water management' — i.e., in wetlands and valley bottoms – can be improved.

Potential for improving dry land crop by in-field water management: There is considerable potential — possibly several times greater than that for irrigation, in terms of cropped areas and numbers of beneficiaries — for improving dryland crop production, particularly staple food crops but also cash crops such as cotton, by in-field rainwater management.

Potential market for agricultural produce: African growth in population and per capita food demand implies that food demand is likely to increase considerably in coming decades. FAO (2002) projects that Africa's population will increase to 883 million in 2015, with a growth rate of 2.6 percent per year. During the same period, per capita GDP is expected to increase by 1.8 percent per year. As a result, aggregate African demand for agricultural products will grow by 2.9 percent per year. In particular, Africa's total demand for cereals will jump to 139 million metric tonnes by 2015, which is 62 percent higher than the average demand level between 1997 and 1999. Among the cereals, demand for maize alone will rise to 46 million tonnes by 2015, some 70 percent more than the current level. According to the same projection, demand for oilseeds and vegetable oils, meat, and dairy products will increase by 3.3, 3.4, and 2.9 percent per year, respectively.

Domestic market for agricultural produce: Domestic food markets are expected to double in volume by 2015, with some increase in demand for superior foods as incomes rise. At current levels of productivity and rates of growth, net imports of wheat and rice are expected to reach 40 million tonnes by 2030 (Table 1), while imports of maize and vegetable oils are also expected to increase

substantially. Overall, on a region-wide basis, cereals self-sufficiency is expected to decline marginally from 82 percent in 1997/9 to 81 percent in 2030 (FAO 2003a:68).

Table 1: **Projected Sub-Regional and Regional Net Trade in Cereals in 2030 (tonnes)**

Sub-region/ crop	Central	Eastern	Gulf of Guinea	Islands and Others	South Africa	Southern	Sudano-Sahelian	Total Sub-Saharan Africa
Wheat	(4 373 200)	(3 646 700)	(6 249 900)	(664 500)	(500 000)	(1 388 700)	(4 311 700)	(21 134 700)
Rice	(2 329 100)	(1 212 900)	(7 848 200)	(912 400)	(1 078 000)	(400 200)	(4 233 900)	(18 014 700)
Maize	(1 475 900)	(1 749 000)	(268 000)	(339 600)	1 000 000	(1 926 800)	(830 000)	(5 589 300)
Barley	(380 700)	(270 300)	(253 500)	(48 400)	(300 000)	(71 800)	(130 300)	(1 455 000)
Millet	(200)	(2 400)	7 100	(300)	0	300	(70 000)	(65 500)
Sorghum	(76 900)	(126 400)	0	(3 000)	2 800	(40 400)	(85 000)	(328 900)
Other	(16 500)	(33 200)	(56 200)	(14 500)	(10 800)	(79 900)	(174 300)	(385 400)
Total	(8 652 500)	(7 040 900)	(14 668 700)	(1 982 700)	(886 000)	(3 907 500)	(9 835 200)	(46 973 500)

Source: FAO 2005a

Irrigated industrial crops, especially sugar and cotton, will continue to supply domestic and export markets. Growth in domestic demand will continue to expand and cotton export prices could rise strongly if American and European protection and subsidies are reduced under the Doha Round (FAO 2006; Diao).

Growth prospects for irrigated horticulture: There are substantial growth prospects for irrigated horticulture, as the range of potential products is vast with more than 80 different commodities identified as 'vegetables and fruits' by UN trade classification. Sub-Saharan Africa's current share of world trade in these products is small (Diao *et al* 2003:61), which means that there are many high value export niches to explore. The market is highly competitive and risky, but low wage rates are likely to preserve the region's comparative advantage and exports could grow fast. The large domestic market, which absorbs most horticultural production, will also expand steadily.

Fodder production is expected to account for only 4.7 percent of total crop output by 2030 (FAO 2006), of which only a small proportion is likely to be irrigated. Fattening and intensive stall-fed systems for milk and meat can be highly profitable where demand for meat and dairy products is firm and the projected increase in demand for these commodities is higher than other developing regions and the world as a whole. However, the increase will be from a relatively small base. Nevertheless, some increase in irrigated production of feed barley, maize, alfalfa and other green fodder crops is likely.

Potential for agricultural products: Improving competitiveness of agricultural products in international, regional and domestic markets is the key to expanding market opportunities. There is great potential for African agricultural products, especially in the regional and domestic markets, but Africa's agricultural products are often not competitive because of low productivity, high transportation and marketing costs, various formal and informal trade barriers (both physical and institutional) and inconsistencies in trade and agricultural policies among African countries. In order to be more competitive, Africa must increase overall agricultural productivity, reform infrastructure and institutions to reduce transportation and transaction costs, reform policies to encourage agricultural trade among the countries in the region and enhance regional cooperation to open European and American markets by removing asymmetric agricultural and trade policies.

In the growing competitive export and domestic markets, African farmers also need instruments to help them manage price and market risks, such as efficient, targeted safety-net programmes and market-based risk-management vehicles, for example, weather insurance and future price contracts (Skees, Hazell, and Miranda 1999). At the same time, for farmers to become better integrated into today's increasingly competitive markets, they must acquire the technologies they need to improve quality and postharvest storage and processing.

Given prevailing world agricultural trade policies and poorly functioning markets within Africa, rapid increases in agricultural production might lead to price declines in the short-term. However, in the long-term, efforts to reduce marketing (transportation and transaction) costs can help reduce

consumer food prices while raising producer incomes. By investing in infrastructure and institutions, African countries can maximise the positive linkage effects of growth in farm and non-farm products. Over time, these linkages will significantly increase gains in overall incomes and calorie consumption, loosening the grip of hunger on the African continent.

2.6.3 Land administration/governance

There is strong emerging consensus on land policy in Africa. Under the African Union, leaders throughout the continent have taken joint responsibility for strengthening mechanisms for conflict prevention, management and resolution and promoting and protecting democracy and human rights. This calls for land policy which both supports the prevention of conflicts and their resolution speedily and efficiently through mutually acceptable dispute processing mechanisms. Policy that is acceptable to a broad stakeholder base also plays a role in the avoidance of conflict, by engendering confidence in the regulatory systems among communities competing for scarce land resources.

The development of a continental framework for land policy is progressing. After a three year process of elaboration, the meeting of African ministers in charge of Agriculture, Land and Livestock in Addis Ababa on 23- 24 April 2004 endorsed the Framework and Guidelines on Land Policy in Africa as a valid tool that can inform national land policy development and implementation initiatives. A declaration on Land Policy in Africa was submitted for adoption at the 13th Assembly of the AU Heads of States and Governments in Sirte (Libya), 1- 3 July 2009. The framework and guidelines will open the way for more challenging implementation activities at country as well as regional levels.

There is increasing information about the availability of a variety of alternative, simpler approaches to land rights registration and local governance approaches:

- Pilot cases from the field demonstrate how land rights can be registered at much lower costs in simple ways, such as has been done in Ethiopia, Mozambique and Benin. Equally, in some places, titling and registration may be much less important than working to strengthen local institutions with responsibility for managing land rights and related disputes. Building on local knowledge and existing land management practices at local level are critical ingredients and systems of land rights documentation can be gradually refined over time. The costs and techniques of land administration also need to match the value of land. Computerisation of land records and the use of new technologies – such as Geographical Positioning Systems (GPS) – to automate land survey and demarcation and for comprehensive parcel maps and a tool for spatial planning can all help bring down costs and streamline administration processes.

- The recent shift towards decentralising government in some African countries has been valuable as a means to get land administration closer to the field and linking it to tenure practices that communities are more familiar with. A range of legal and institutional innovations have also been developed in West Africa such as: (i) home grazing lands (Niger); (ii) local conventions (Mali); (iii) land commissions at arrondissement and villages (Niger); (iv) tenure certificates (Côte d'Ivoire); and (v) land registers (Comoros). Local conventions are agreements between villages and government services about the use of natural resources. In Mali, such practices have allowed many vulnerable populations to access land and have reduced land-related conflicts.

3.0 Strategic elements for extending the area under sustainable land and water management systems

3.1 Guiding principles for SLWM

Effective SLM and water strategies require **multi-stakeholder** partnerships to bring together indigenous and scientific knowledge and to reconcile different stakeholder interests and needs within the public and private sectors, including community-based and civil society groups. Furthermore, a **multi-sectoral** and **multi-disciplinary** approach is essential as no one agency has all the

disciplinary experts required to solve the **multi-dimensional** problems of agricultural water management and land degradation. Successful implementation is, therefore, fully dependent upon coordination and cooperation in planning and decision-making among different government agencies, especially those responsible for agriculture, livestock, forestry, land and water resources, environment, science and technology, finance, planning and legislation. It is critical that these multi-stakeholder partnerships and multi-sectoral approaches are done at **multiple scales.** The concept of multiple scales reflects both natural and administrative or decision-making units found at the local, sub-national, national and trans-boundary levels. Multi-dimensional management cannot be achieved without identified responsibility and accountability supported by integrated programmes, policies and investments within and among African countries.

It is clear from a review of past efforts to promote SLWM in Africa that no universal blue print exists for successful development approaches. What works in a particular location is influenced by a variety of area-specific factors such as: (i) the limitations and opportunities imposed by the local climate and other ecosystem resources; (ii) household and community perceptions as to the nature, severity and consequences of existing degradation on local natural resource-based livelihoods; (iii) social and cultural norms that influence individual and communal behaviour within the local society; (iv) presence or absence of effective community organisational and institutional structures with strong and respected leaders; (v) the nature of the political system that governs the implementation of national and local level development policies; (vi) capacity and availability of local advisory support services; and (vii) the type of local market structures and opportunities.

Box 5: Irrigation considerably enhances farm incomes, livelihoods and employment opportunities at irrigation schemes in Tanzania and Zimbabwe

At the Participatory Irrigation Development Project in Tanzania, irrigator households achieved an increase of 86 percent in income, enabling them to enjoy better quality housing, acquire agricultural and household assets, access health services and finance children's education. In four representative sub-project areas (totaling approximately 400 ha), ownership of ox carts and cattle increased considerably, the number of grinding mills rose from two to 12 and the number of shops grew from two to 74. Positive results were also achieved by irrigator households at the EU-funded Maunganidze Irrigation Scheme in Zimbabwe. Incomes among participants rose by more than 200 percent and turned a food deficit into a surplus sufficient to feed two additional households. Farmers' own investments in new housing and in water and sanitation were the most obvious signs of improved livelihoods, with a number of modern two or three room houses, ventilated pit latrines and in a number of cases their own protected water wells. Traders reported increased sales of agricultural inputs and implements, groceries and building and construction materials. New grinding mills were established as well as workshops for manufacturing farming equipment such as ox carts. There was no doubt that these impacts were the result of investment in irrigation because there were no other sources of income in the area. Excellent road access, for example, by itself had not had any discernible impacts on poverty in the area.

Source: IFAD, 2007

3.1.1 Social/people-centred management and approaches

While a challenge, there are some common elements to be found within the diversity of successful SLM and water strategy approaches in Africa, as follows:

- **Community-based participatory planning and technology development.** The most successful efforts have built on rural people's inherent skills and capability and empowered them to formulate and implement their own development plans and develop and disseminate their own SLM and water technologies.

- **People-centred learning.** Based on innovative and participatory adult learning methods, this involves guided practical field-based investigations through which land users learn for themselves about particular crop production and land degradation problems. They also learn how to identify ways of addressing these challenges through observation, testing and monitoring of different treatments as well as reviewing and sharing findings through sub-group and plenary discussions within common interest groups.

- **Cultural and gender sensitivity.** Success has been seen in programmes where emphasis was placed on encouraging the participation of marginal groups (women, youths, poor

households, ethnic minorities, etc) in community decision-making and improving their access to communal ecosystem resources in ways that build on and as necessary encourage adaptive changes to the social and cultural norms of the wider community.[7]

- **Decentralised development.** Two forms of decentralisation have evolved: "decentralised sectoral" and "decentralised local government." Decentralisation is not an end in itself, but is rather a means to developing effective, responsive, demand-led services and in particular to making government services more locally accountable to rural people.

To be successful, investments must take into consideration imperatives of farm-level profitability, viability and sustainability as well as gender issues. Investments need to be economically viable, financially profitable and socially and environmentally sustainable. Future designs and investment decisions — including those for major infrastructure — should be based solely on considerations of economic viability, farm level profitability and sustainability. However, where downstream benefits can be quantified these should taken into account in the analysis. Similarly, where there are opportunities for multi-purpose investments these should be taken advantage of and accounted for in project costs and benefits. Poverty reduction and gender inclusion objectives of investments need to be clearly defined and demonstrably supported by intended activities, inputs and outputs of projects.

3.1.2 Sector-wide approaches (SWAps)

Generally, SWAps are intended as a means to coordinate and harmonise efforts at policy dialogue, institutional reform and efficient investment. In recent years, a number of African countries have begun to develop sector-wide approaches, moving progressively away from project to programme approaches within a coherent strategic framework, a movement strengthened by the Paris agreements on aid effectiveness. Sector-wide approaches are based on a partnership between: (i) the government, which is expected to provide leadership and develop a coherent sectoral strategy; (ii) international development partners, who are expected to align their support on the country-led strategy and, to the extent possible, harmonise their support through common arrangements for financing and technical assistance; and (iii) other stakeholders, including civil society and the private sector. In contrast to earlier approaches, SWAps are intended to focus not only on the financing of a comprehensive investment programme, but also on policy dialogue and change as well as on the provision of support to and reform of national institutions (IFAD, 2007).

The potential benefits from SWAps are, essentially, enhanced development impact and lower transaction costs. At the strategy level, this should be characterised by stronger country ownership and leadership, a coordinated and open policy dialogue and prioritised and rational resource allocation. At the institutional level, the approach should help strengthen national capacity, systems and institutions. At the implementation level, scaling up of best practice and benefits to the entire sector should be easier. There should be sector-wide accountability, ultimately with common fiduciary practices and environmental and social safeguards and a focus on results and reduced duplication in reporting and transactions.

3.1.3 Ensuring integrated water resources

It is necessary to ensure integrated water resource management from the river basin level to the end users. Thus, as most rivers in Africa cover international boundaries and with the major basins having more than four riparian countries, cooperation and a shared strategic vision in common water resources management among concerned countries is a key element for sustainable development. Given the predominant role of agriculture as a water user, agricultural water investment plans need to be well articulated with the overall water resource planning and management process at country, sub-basin and basin levels. For countries that have a high dependence ratio – such as Mali, Ghana, Mozambique, Niger, Egypt, Sudan and Chad – a Trans-boundary Integrated Water Resources Management (TIWRM) approach for sharing water resources should be the guiding principle in water allocation decisions.

[7] This often involves challenging existing assumptions and prejudices that currently limit the participation of such marginal groups, but this is done in a non confrontational manner, in ways that respect local customs and traditions with the emphasis on showing the benefits to the community of addressing current barriers to the active participation of such groups.

3.1.4 Landscape and ecosystem management approaches

- Planning within locally recognised landscape units – the landscape approach draws on principles of landscape ecology (e.g. open exchange systems for energy, nutrients, and minerals, all elements are interacting, etc) and has evolved from watershed planning within the hydrological boundaries of a small catchment to the development of local SLWM action plans within traditionally recognised blocks of land. These may correspond to the cultural and administrative boundaries of the participating communities or relate to one or more natural landscape units traditionally allocated for specific land uses (e.g. rain-fed crop production, irrigated farming, grazing, forestry, etc).

- Holistic and integrated planning – involving a long-term strategic and broad scale ecosystem/ landscape approach, which aims to improve land management in order to obtain production and environmental benefits (e.g. reduced erosion, improved soil fertility, higher yields, increased food security and enhanced rural livelihoods).

- Landscape territorial development- involves diagnosis and analysis of territorial (rural and urban) issues at a landscape scale and provides a platform for multi-stakeholder negotiation and collaboration to put in place sustainable practice and policy solutions, thus, pre-empting problems that arise from competition over use and access to land and other natural resources.

3.1.5 Implementation conditionality

Creation of the right enabling conditions is a critical issue, as there are many bottlenecks and constraints within the wider society that can hinder the local level adoption of SLWM practices. A successful project requires that the most critical challenges are identified and addressed. Depending on the local situation this may require: (i) creating supportive legal and regulatory instruments (e.g. national legislation to provide a regulatory framework for the enforcement of community level by-laws); (ii) improving market structures for the supply of inputs and sales of surplus produce; (iii) building the capacity of community-based organisations to prepare and implement SLM action plans and water strategies; and (iv) strengthening local advisory support services to ensure they have the capacity to support interventions at the farm/community level (particularly post project).

3.2 Best practices

Within Africa, there is a significant body of experience with the development and adoption of different SLWM technologies, practices and approaches aimed at promoting sustainable products and reducing land degradation. Emerging through different entry points, important baseline experiences come from programmes that have promoted one or more of the elements, as outlined in the following sections.

3.2.1 Crop production and management

- Soil fertility improvement through better land husbandry was advocated by many of the national strategies and action plans of the Soil Fertility Initiative for Africa[8]. Better land husbandry is a broader concept than soil and water conservation because it addresses the totality of the farm household livelihood system with the aim of improving the productivity and sustainability of its natural resource-based land use activities. At its core is the belief that farmers have the ability to better manage and improve (or husband) their land resources, thereby, enabling their use for productive purposes on a sustainable basis. In the Sahel, 250,000 hectares of degraded land have been reclaimed since the early 1980s by projects and communities through simple anti-erosion and water harvesting techniques, such as land

[8] The Soil Fertility Initiative was launched during the 1996 World Food Summit as a joint programme sponsored by the World Bank, FAO, International Agricultural Research Centres (represented by ICRAF), the fertiliser industry and bilateral donors.

cuttings, zaï, half moons and rock bundles. These lands are now crop and grasslands. The land management projects have an internal rate of return that is above 30 percent.

- Conservation agriculture aims to restore, sustain and enhance agricultural production through the integrated management of locally available soil, water and biological resources, combined as required with cost-effective use of external inputs. It is a holistic approach to agricultural production based on enhancing natural soil biological regeneration processes involving: (i) improved soil organic matter management for the efficient use of rainfall, soil moisture and plant nutrients; and (ii) the maintenance of soil physical properties by keeping mechanical tillage to the absolute minimum required for direct planting/seeding. The following inter-related criteria distinguish conservation agriculture from conventional agricultural systems: (i) reduced or zero tillage; (ii) permanent soil cover (plant residues and/or cover crops); (iii) crop rotation; and (iv) minimum in-field traffic. The approach has been widely adopted by farmers in Latin America, North America, Australasia and Central Asia. Although not yet widely adopted within Africa, the area under conservation agriculture is expanding in South Africa, Zambia, Uganda, Tanzania, Kenya and Madagascar, where it is known as *systeme de couverture vegetale*. The approach is also being piloted in Burkina Faso, Niger and Mali. In Cameroon, conversation agriculture has allowed for:

    - A 20 percent increase in the output of cotton and 15 percent increase in the output of sorghum;
    - Less working time and higher incomes; and
    - A carbon fixation per hectare that grew from 500kg to 2 tonnes per year during 10 years.

- Integrated plant and pest management (IPPM) has evolved from a single crop-pest focus to more comprehensive efforts that combine investigations into various production related problems and includes a variety of focus areas ranging from integrated pest management to integrated plant nutrient management. The emphasis is on providing farmers with the skills required to grow healthy crops. Recently, programmes have expanded the range of crops covered to include staple food crops such as bananas and cassava and to consider wider social and cultural factors (nutrition, HIV/AIDS, labour, business skills and marketing). The farmer field school approach is the principle vehicle for farmer learning and adaptive IPPM management. A dozen African countries – Benin, Burkina Faso, Burundi, Ethiopia, Kenya, Mali, Niger, Senegal, Tanzania, Togo, Zambia and Zimbabwe – have developed country-specific recommended plant nutrient practices using guidelines from the FAO IPNM Information System.

3.2.2 Pastoral and livestock management

- Integrated crop-livestock farming systems have been promoted in the Sahel region using community-based approaches, leading to improved cycling of nutrients between range-lands and cropland and ruminant livestock and soils.

- Opportunistic management strategies by pastoral communities[9] have developed in response to uncertainties over rainfall and feed availability in arid and semi-arid environments. During drought periods this may involve: (i) long distance transport of animals to feed-surplus areas (trekking, truck transport, etc); (ii) feed supplementation (lopping, hay-making, concentrate purchases, etc); (iii) cereal stores to prevent needless distress livestock sales; (iv) good animal health care as livestock die more of disease than starvation during drought; (v) diversification or changes in the species composition of the family herd; and (vi) supplementation or diversification of income from non-animal based livelihoods. After drought, this may include: i) investment/re-investment of surpluses from other activities in livestock (especially small stock with high reproductive rates), and ii) transfers of animals within social networks (whether kinship based or with stock associates) on which individuals have legitimate claims. Furthermore, grazing strategies that improve range productivity and

[9] For a detailed review of new directions in pastoral development in Africa, see Scoones 1995.

quality that can enhance drought tolerance are being practiced in east and southern Africa (Savory, 1999).

- Livestock production supports food security and the provision of employment, income, food, fuel, farm power and a variety of merchandise goods. The bulk of animal-source food available to households in West Africa is derived from ruminant livestock, which is predominantly produced by pastoralists. A significant proportion of these pastoralists employ (opportunistic) migratory production strategies. For most African pastoralists, mobility is still a key element of production strategy. Pastoralism as a livelihood activity is practiced in a variety of ways as a response to the dictates of the immediate environment and available resources. A greater proportion of the total ruminant population of the region is produced under this system.

- Policies, agreements, treaties and legal texts relating to pastoralists in West Africa are emerging. In the Sahel countries, in particular, legal texts and pastoral codes were adopted recently and applied with varying degrees of success. Such laws – which can be seen in Burkina Faso, Mali, Mauritania and Niger, where it is still under development – are related to the access, durable and peaceful use of common pastoral resources. Examples of pastoralists laws include:

    - National legal texts having milked with the practice of the pastoral breeding, animal health and land rural;
    - Agreements or conventions on transhumance; and
    - Medical zoo agreements or conventions regarding the health of animals that cross borders.

3.2.3 Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC)

The prevalence of trypanosomiasis makes it both difficult and uneconomical to raise productive livestock breeds because they are highly susceptible to the disease. While mixed farming is commonly practised in other parts of the world, where tsetse flies are absent, in most of Sub-Saharan Africa, livestock production is separated from crop production. In addition, avoidance of tsetse-infested areas causes people and livestock to crowd into the few, often environmentally fragile, tsetse-free areas available.

The burden of living with trypanosomiasis among livestock-keepers or small-scale mixed farmers are multiple and diverse, because of the multiple functions and value of livestock in Africa's rural livelihood systems. This includes among other the loss of draught power, the inability of liivestock to graze in certain areas and for people to have access to arable land and water in an area covering close of 9 millions km².

During the Summit the Organisation of African Unity (OAU) held in Togo, in July 2000, the African Heads of State and Government adopted a decision (AHG/Dec. 156 (XXXVI) urging Member States to act collectively and embark on a Pan African Tsetse and Trypanosomiasis Eradication Campaign, to eliminate the disease and its vectors from Africa, once and for all. The decision to embark on the PATTEC initiative not only underscored the seriousness and significance, which African Governments attach to the tsetse and trypanosomiasis problem, but it also defines their readiness and willingness to assume the primary responsibility of implementing the objectives of the decision.

The concerted implementation of PATTEC initiative will contribute to the extension of millions of hectares for sustainable land and water management. Six countries 5Burkina Faso, Ethiopia, Ghana, Kenya, Mali and Uganda have been engaged since 2005 through a financial support of the AfDB amounting to USD 70 millions for the creation of tsetse and trypanosomiasis free areas (240 000 km²) in East and West Africa in the first phase of the Programme. Further, the AfDB and other partners (BADEA, WHO, FIND, AIEA, among others) have committed to support the programme by funding bankable projects of eligible countries in the coming years.

3.2.4 Agroforestry and forestry

- Agroforestry and soil fertility improvement – involving the growth of woody perennials (trees, shrubs, palms, bamboos, etc) on the same plot of land used for agricultural crops and/or livestock in ways that permit significant economic and ecological interactions between the woody and non-woody components. Within Africa, the World Agroforestry Centre[10] has been instrumental in documenting and promoting indigenous and derived (i.e. research station) agroforestry systems for soil fertility improvement.

- Forestry – afforestation and reforestation involves planting trees for shelterbelts, windbreaks and woodlots to increase fuel wood, timber and fodder[11]. Tree planting has been recognised for its capacity to sequester carbon while conserving soil and water quality and quantity. The Green Belt Movement in Kenya, well known for tree planting, includes indigenous trees in forest catchment areas and riparian reserves to preserve local biological diversity. Programmes such as Farm Africa in Tanzania and Ethiopia promote local community-based forest management for conserving and enhancing forest resources while reducing forest losses and illegal logging[12].

- West Africa is home to several success stories, including the *Sahel vert* programme conducted in the Sahel countries during the 1970s and 1980s, which employed local arrangements to control the use of trees (ICRAF, March 2008). As a result, in Niger alone, regeneration is close to 30 million hectares. The programme transferred use and management of agro forests from the government to rural populations and a concept of "contracts of cultures" in protected areas was promoted. Users were encouraged to plant trees for producing wood for buildings, firewood and for ecological purposes, having been first sensitised about protected species and their sustainability. A monitoring system was put in place to ensure sustainability.

3.2.5 Water and irrigation management

- There have been recent successful project investments in small-scale community managed irrigation. Examples include: (i) small-scale run-of-the-river rice schemes developed at low cost ($1,070/ha) under the Tanzania Participatory Irrigation Development Project that achieved a rate of return of 22 percent and increased farm incomes by 86 percent (IFAD, 2007) and ii) the Ethiopia Social Rehabilitation and Development Fund, where community-based irrigation, supplied largely from earthen dams and river diversions, benefited some 40,000 households. Visible improvement in the lives of villagers included increased purchase of water pumps, milk cows and radios as well as regular schooling for children (World Bank, 2002a).

- The Sahel countries successfully tested strategies of valorisation of water resources. Small family irrigation was installed on 0.25 hectare lots in Mali, Burkina Faso and Niger, as well as a number of other countries of the CILSS. Giving poor families partial or total control of water helped increase their farming productivity and access to basic food products.

- In West Africa, a common policy for water has been initiated by ECOWAS with the support of the CILSS and the UEMOA. This policy allow for an integrated management of the resource, its diversified and equitable use and protection. Under the World Coalition on Water in the Sahel initiative, CILSS countries aim to combine efforts to combat hunger and poverty through water resource management. The initiative aims to develop a common framework to stimulate and enhance national and regional plans.

[10] Formerly known as the International Council for Agroforestry Research (ICRAF), with headquarters in Nairobi Kenya
[11] Afforestation Project in Kano and Jigawa States, Nigeria, UNEP Success Story, http://www.unep.org/desertification/successstories/8.htm
[12] Farm Africa http://www.farmafrica.org.uk/ and Green Belt Movement, Kenya http://www.greenbeltmovement.org/

Box 5: Successful public large-scale irrigation in Mali: the Office du Niger

The Office du Niger (ON) in Mali is one of the oldest and largest small holder irrigation schemes in Sub-Saharan Africa. When development of the scheme began in 1932, it was intended to cover about 1 million hectares over 50 years. By 1982, however, only 60,000 hectares had been developed, of which a large part had been abandoned due to poor maintenance and operation. Cotton production had ceased and average paddy yields had slumped to 1.6 t/ha. Attempts to rehabilitate the scheme proved successful when physical investments to improve water security were matched with institutional reforms. An impressive turnaround has been achieved: In addition to the 50,000 hectares that was still in use at the time, about 10,000 hectares of previously abandoned land was reclaimed and put to productive use, causing average paddy yields to rise to 6 t/ha. O&M cost recovery reached 97 percent.

These results are attributable to a combination of factors, including:

- Irrigation system improvement and modernisation;
- Improved water control and management;
- Adoption of improved technologies –such as high-yielding varieties, fertilizers and improved husbandry practices;
- Liberalization of paddy marketing and processing, facilitated by an improved macro-economic climate;
- Improved land tenure security;
- Institutional restructuring, including: privatization of most commercial functions, contracting out of maintenance works to the private sector, downsizing of the management agency and concentration on its core activities of bulk water supply, land administration, and agricultural extension; and
- More participatory approaches that engage farmers in management decisions, e.g., on O&M fees.

The long-term commitment of government and managers and the sustained support of external partners underpin this success. The work at ON is, however, not yet complete. There is more to be done on strengthening farmer organizations, improving land tenure security and making the agency more accountable to farmers.

Source: Aw and Dejou, 1996; Couture et al., 2002; Aw and Diemer, 2005

- Individual market-driven investments by smallholders with low-cost technology. The Niger Pilot Private Irrigation Project spread the use of a variety of manual and small-scale mechanised irrigation technologies. Manual pumping technology allowed a doubling of the cultivated area and earned a 68 percent economic rate of return (World Bank, 2002b). The DFID-funded Micro-Irrigation Pump Promotion Project (MIPP) and its predecessors created a demand and a supply chain for treadle pumps in Kenya and Tanzania. The private sector was then able to manufacture and distribute the pumps at a profit but still at a price affordable to farmers (IFAD, 2007).

- Market links combined with reliable water supplies. Under the IFAD-funded Zimbabwe Pilot Market Linkage Project, an NGO facilitated the establishment of grower associations and production of crops under contract to a local canner. Farmers also produced an irrigated crop of grain maize in the summer for home consumption and local sale. With an assured market and reliable groundwater supplies, farmers risked investment in inputs to obtain higher yields and achieved a 265 percent increase in farm income (IFAD, 2007).

- Large-scale irrigation. Examples of successful public investment in large-scale irrigation are few, owing to top-down planning, shaky economies and institutional failures. To succeed such projects require transparent, accountable, efficient and financially self-sustaining institutions. The Mali Office du Niger is a good example of the impact of comprehensive but gradual institutional reforms. The programme achieved a turnaround from a dirigiste approach to one that is more service-oriented and which, by combining selective investment in hardware with institutional change, has produced impressive results (see Box 6). This experience shows how other large-scale irrigation schemes may be turned around, provided that the underlying economic profitability is there. One reason for the success of Office du Niger was that institutional reforms were introduced gradually, allowing time to overcome resistance to change and allowing time for adjustment, adaptation and fine-tuning.

- Water harvesting involving the combination of new and indigenous technologies as well as mechanisms to enhance rainfall capture (e.g. v-shaped micro-catchments). These technologies are increasingly being promoted by a number of national and regional

programmes, since reliance on irregular and unreliable rainfall for agricultural production is seen as a major constraint on crop productivity and many high-yielding crop varieties are unable to achieve their full production potential under rain-fed conditions. Although a wealth of academic and research literature on the topic exists, there has been a dearth of investment analysis. However, the knowledge base is thin in respect to investment performance analysis and evaluation.

- One frequent feature of recent investments has been the use of a decentralised programme approach, in which the criteria for sub-project selection are agreed up front but the process of selection is decentralised, typically to the level of a joint identification and appraisal process between a project unit and irrigator organisations. A programme may be restricted to irrigation investments - for example, the Nigeria National Fadama Development Project - or irrigation may be offered as an item on a broader menu of investments, as in the Batha Rural Development Project in Chad. However, there is a risk of poor investment decisions being taken if adequate provision is not made to build capacity for sub-project appraisals and subsequent cost control and supervision.

3.2.6 Community-based national resource management

- Community-based land or watershed planning and management[13] – a number of different projects and programmes in east, west and southern Africa have successfully used participatory approaches to identify local priorities and develop community action plans for tackling land degradation and low agricultural productivity, through improved ecosystem resource management (soils, water, vegetation, forestry, wildlife, etc) within locally recognised landscape or watershed units.

- The regional solar programme implemented by CILSS in the Sahel countries helped some 5 million people access drinking and pastoral water. It also has contributed to environmental protection and poverty reduction.

- A common water policy has been initiated by ECOWAS with the support of the CILSS and the UEMOA promoting an integrated management of water resources, their diversification, equitable use and protection.

3.2.7 Farmer learning networks

- The farmer field school (FFS) approach for integrated soil management is based on the concepts and principles of people-centred learning and was developed as an alternative to the conventional top-down test and verification extension approach. It uses innovative and participatory methods to create a learning environment, including learning networks, in which land users have the opportunity to learn for themselves about particular crop production problems and ways to address them through observation, discussion and participation in practical field exercises. The approach is now being used to enable farmers to investigate and overcome a wider range of SLWM problems, including soil productivity improvement, conservation agriculture and control of surface runoff as well as water harvesting and improved irrigation.

- In the Sahel, the evolutions in the cultivable surfaces were accompanied by a better knowledge of the hydrological forecasts. The production and the dissemination of data on climate by AGRHYMET centre of CILSS allowed the integration of the climatological factors in the farming calendars of Sahel countries.

3.3 Building on lessons learnt

[13] In Africa typically known as the catchment approach to soil and water conservation in Anglophone countries, or gestion des terroirs in Francophone countries

With considerable experience to draw upon, substantive lessons are emerging that can increase the prospects for success. A recent review into the local level drivers associated with the development of SLWM success stories in Africa and the collaborative program of AfDB, FAO, IFAD, IWMI and the World Bank on agricultural water development identified, among others, the following as essential key elements :

- **Quick and tangible benefits:** Immediate tangible benefits to the community or individual are a prerequisite for the development of a success story. This may include increased yields within the first year of implementation, or a reduction in the costs of labour and other inputs.

- **Low risk of failure:** Poor farmers are risk adverse. Hence, any change to the current status quo must have a low level of risk associated with it.

- **Farmer involvement improves design and reduces costs:** Organisational arrangements for project design, implementation and management are more efficient when they reflect the comparative advantages of the public sector, farmers, NGOs and the private sector. Sustainability is best achieved by involving farmers throughout and by handing over schemes to farmer organisations once complete. Often it can be more efficient to obtain implementation services from the private/NGO sector than to build public sector institutions for the purpose, even where local private/NGO sector capacities are weak.

- **Market opportunities:** If there is to be a change in practices that are contingent on the production of new or alternative crops/products, markets need to be present and assured.

- **Aspirations for change:** This reflects an internal demand by an individual or community for change that may be driven by the desire to try something different.

- **Innovation and appropriate technologies:** External and internal innovations, new technologies and information are important components in change. Internal innovation and appropriate technologies include the revival of traditional and local knowledge. External innovations reflect new developments in techniques and technologies, including associated skills and knowledge that, if adopted, effect a positive change to the production system. The increase in precipitation, control of surface water by the creation of water levels and mobilisation of underground water resources ensure the availability of water for humans, animals and agriculture.

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- **Leaders, champions and innovators:** Often, a single individual or group may champion change. The initial involvement of an external facilitator such as an NGO or government agency may be required to take on this role.

- **Social capital:** Community organisations, networks and partnerships (private as well as public) that develop in order to promote change.

- **Participatory approach and empowerment of land and water users:** Deliberative processes that actively involve the community in the decision-making process. This has been shown to have a strong element of collective learning among farmers and development workers and involves the establishment of a trusting and equitable partnerships.

- **Supportive policies:** Changes in policies at the local, regional and national levels facilitate the development of bright spots. Of particular importance is enhancing individual property rights and ownership to increase the willingness of individuals to invest in and facilitate change. However, reforms require time and consistent approaches by governments and donors. Decentralising development responsibility can also enhance impact. Reforms need to be accompanied by effective capacity building to equip the actors to cope with new roles and responsibilities.

- **Financing and support for policy development:** Many countries have tended to rely too much on donor support for policy development, thereby jeopardising the ownership and

sustainability of the reform enterprise, especially as donor funds are cut or dwindle due to donor fatigue.

- **State sovereignty over land must change:** In all African countries, the state is the first owner, manager and inspector of land resources. But research shows that state sovereignty over land is a serious constraint in efficient and sustainable land use. Furthermore, the state often lacks capacity and resources to carry out its land-related functions.

- **Sound and equitable land policies can be an effective a tool to promote social stability and reduce the risks of conflicts:** In the post-conflict mechanisms, creation of a new baseline responsible for managing land access is an essential component for setting-up regulatory institutions in post-conflict environments.

- **Reforms are necessary at central government level, but also in local administration:** Institutional reinforcement involves the setting up of best systems for control and balance to make structures responsible. For land issues, this involves a system of transparent land record.

- **Integrated approach:** Beyond promoting technological improvements, an integrated approach is needed to address soil and water productivity problems as a core element of SLM and water strategies in the context of improved crop, livestock, forestry production and maintenance of biodiversity.

- **Farm-level profitability, viability and sustainability:** SLWM in Sub-Saharan Africa can make an important contribution to poverty reduction and growth. It can only do so, however, when investments are profitable, economically viable and sustainable at the farm level.

Box 6: Farm level profitability and viability

Without farm-level profitability, income poverty reduction cannot be achieved. Without financial, social and environmental sustainability, there can be neither economic viability nor farm level profitability. Investments for so-called 'social' or 'strategic' purposes for example, to increase national production of staples cannot contribute to growth or poverty reduction if they are not economically viable.

Future designs and investment decisions including those for major infrastructure should be based solely on considerations of economic viability, farm level profitability and sustainability

However, where downstream benefits can be quantified, these should be taken into account in the analysis. Similarly, where there are opportunities for multi-purpose investments, these should be taken advantage of and accounted for in project costs and benefits.

*Source*s: AfDB, FAO, FIDA, IWMI and World Bank collaborative programme "Investment in AWD for Poverty Reduction and Economic Growth in Africa."

- **Targeting the poor, women and marginalised communities, such as pastoralists:** The design of SLM and water strategy investments should address all strata within the community, ensuring that all benefit to their mutual advantage. Exclusively targeting the poorest socio-economic stratum is not necessarily effective in reducing poverty, although specifically targeting women can be. Similarly, targeting the driest agro-ecological zones is not necessarily 'pro-poor'.

- **Building in incentives for all partners to change:** The design of programmes for institutional reform should recognise that time and sustained commitments are required. All partners need to work to a harmonised common agenda, align support on national programmes and institutions and invest in capacity building.

- **AWM investment costs in Sub-Saharan Africa can be similar than those of other regions:** Although the cost of public irrigation development in Africa has historically been excessively high, a new generation of well-designed and implemented irrigation projects has proved to be only marginally more costly than in other regions. Where water supplies have been reliable – with good access to markets and conducive institutional environment –

productivity has proved comparable with that of post-Green Revolution Asia. Providing irrigation water alone will not guarantee increased productivity – not only must water supplies be reliable but they must be provided as part of a comprehensive and sustainable package that empowers farmers to commercialise their yields and production as well as giving them incentives to do so, including improved access to input and output markets.

- **The best-performing irrigation projects of recent years are:** (i) Individual market-driven investments by smallholders with low-cost technology; (ii) small-scale community managed irrigation schemes; and (iii) large-scale irrigation with transparent, accountable, efficient and financially self sustaining institutions (e.g. Office du Niger in Mali).

- **Under in-field rainwater practices, productivity gains can be considerable when farmers also have access to yield enhancing inputs:** Farmer yields obtained from conservation farming plots have often been more than double those from plots on which conventional tillage is practiced. However, these increases appear to be closely connected to the level of extension support and input packages provided by projects. Once project support falls away, so do yields. A range of low-cost in-field rainwater management technologies is available for stabilising and increasing the yields of dryland crops. The results of demonstrations and pilot projects to date have been promising and the potential for scaling up — especially for production of non-rice staples and possibly cash crops such as cotton — could be considerable. Because dryland farming is the predominant production system, improving its productivity could have a very substantial impact on production and poverty reduction. However, adoption rates have so far been poor.

- **Investment in agricultural water requires accompanying investment in agricultural support services:** Investment in agricultural water is not on its own sufficient to ensure optimal yields, productivity and incomes. Water supplies must be reliable and provided as part of a comprehensive package that enables farmers to maximise productivity and profitability as well as creating the incentives for them to do so.

- **AWM can have both positive and negative social, environmental and health impacts,** such as improving pastoralists' access to water and feed, safeguarding natural habitats, improving nutrition, improving access to health facilities and health service provision and providing water for domestic purposes. Agricultural water management can help mitigate the impacts of HIV/AIDS through increased incomes and better nutrition. However, negative social, environmental and health impacts of AWM are also widely documented. Inadequate assessment of potential impacts and absence of design measures to mitigate them – as well as weaknesses in the public sector institutions responsible for regulating environmental and health aspects – can lead to reduced productivity, project failure and increased human suffering. The challenge is to design, implement and manage projects in such a way that socio-economic benefits are maximised while negative impacts are minimised.

3.4 Priorities and options for upscaling sustainable land and water management

3.4.1 Institutional issues

Promoting institutional reforms: New investments have to take on board the fundamental lessons of the past, namely that only a farmer who is empowered with a share in decision-making will invest and produce as expected. Thus, macro-economic and sectoral policies, legal frameworks and organisations need to be in place that define and deliver an efficient role for government, promote private sector and farmer investment, empowerment and cost sharing and provide for efficient management of irrigation scheme. Furthermore, water investment strategies need to ensure that institutional aspects such as legal frameworks for land and water entitlements and for farmers' organisations participation and empowerment are analysed and constraints taken into consideration. This is particularly the case with the policy and institutional reforms and capacity building under which the changing role of concerned government institutions and involvement of local actors will take place.

SLWM practices should act as catalysts in the partnership between various stakeholders and the long-term goal of sustainable development: Institutions must strive to develop policies, regulations and structures such as improved land tenure systems and pricing systems to appropriately value renewable natural resources, including water, to encourage efficient and sustainable use and management. The implementation of innovative practices requires alongside effective participation by a broad range of stakeholder groups, including local communities who are essential to the success of projects and their indigenous knowledge invaluable. There should be capacity building at the local, national and regional levels aimed at creating the appropriate enabling environment and institutional capacity to support SLWM. Developing capacity should be based on the existing capacities, potential and aspirations of the local community in question.

3.4.2 Policy issues

3.4.2.1 Land policy issues

As stated in the Africa Land Policy Framework (AU, 2009): "Land is central to sustainable development. Land resources are used for a variety of purposes, which interact and may compete with each other. It is, therefore, imperative to plan and manage all land uses in an integrated manner to ensure that land use facilitates the overall sustainable development of the continent, hence the necessity for the development of comprehensive land policies."

Therefore, it is crucial that countries develop comprehensive policies to resolve problems inherent in that sector. Land policy and governance must address in priority the following broad issues:

Issues relating to the ways in which land is held and distributed, including: (i) the question of state sovereignty in relation to land; legal dualism in national property systems; (ii) inequities in the distribution of land; and (iii) widespread tenure insecurity, including among those holding land under customary tenure or, especially in urban areas, informally. Women, pastoral communities and people living with HIV/AIDS are often further marginalised. Young people may also be disadvantaged in terms of access and/or rights to land.

African countries general lack land policies that regulate the allocation of high-value arable land between competing uses of land such as food production and agriculture, speculative holdings, agro-fuel land uses, infrastructural and others. There is also a lack of sustained political commitment to address the most difficult policy challenges, arising equally from past legacies and emerging challenges. To be successful, land policies will have to address this gap.

Issues relating to land use, which are inextricably linked with those relating to tenure security, increasingly have an urban, not just rural or agrarian dimension. This includes questions around the protection of the commons and sustainable environmental management more broadly. Tensions exist between market-oriented and pro-poor priorities. Land policy development should, therefore, seek to rationalise the relationship between the two sometimes apparently competing objectives. Striking that delicate balance remains problematic.

Issues relating to the integration of land policies with other national policies and regional or even continental initiatives, including macro-economic policy, gender policy, urban and housing policy, forestry and wildlife policy, tourism policy, industrial policy, youth development and environmental management. Policy development has tended to follow sectoral paths, with little or no coordination or harmonisation with other sectors and cross-cutting policies, in particular in the natural resources management sector and poverty reduction programmes (e.g. generally, policies to promote environmental protection and improvement of land and labour productivity are not adequately incorporated into land reform policies).

Issues related to the management of some critical emerging challenges such as global warming and climate change, energy and bio fuels as well as foreign investment, including the questions regarding the "new scramble" for Africa.

Issues related to the formulation and implementation of land policies. There have been low levels of stakeholder and civil society involvement in policy formulation. Despite popular participation in some countries, the state has generally played the dominant role in driving and shaping land policy formulation. In addition, frequently inputs from stakeholders and civil society to land policy development have been ignored or not fully considered. There is also an inadequate human and institutional capacity to design and undertake policy development and subsequent implementation, thus, rendering many policies incapable of being implemented.

Issues related to the provision for adequate budgetary allocations: In Africa, there is a failure to make provision for adequate budgetary allocations to underwrite the cost of land policy development and implementation, including capacity gap assessments and medium- to long-term strategies and programmes to deal with capacity constraints.

Box 7: Key issues/problems to which land policy must respond

- State sovereignty over land
- Unequal distribution of land resources – colonial legacy
- Dualism in property systems
- Land tenure security
- Enhancing productivity issues in agriculture
- Sustainable management of the environment
- Protecting the commons, including managing pastoral land use
- Improving land rights security in urban and peri-urban areas
- Addressing gender biases in land relations
- Managing the impact of HIV/AIDS
- Restructuring land administration systems
- Managing land use in post conflict reconstruction
- Managing emerging issues regarding land such as global warming and climate change, bio fuels, food security and environmental change, land for investment and foreign investment
- Managing land policy development and implementation processes

3.4.2.2 Agriculture Water Management policy issues

There is now a general consensus concerning need for national strategies to reform Agriculture Water Management (AWM) in Africa. The paper "Investment in agricultural water for poverty reduction and economic growth in sub-Saharan Africa" (June 2007) suggested ways in which increased investment in agricultural water management could make a sustainable contribution to further poverty reduction and growth.[14] This in particular through: «*increased investments in agricultural water development and institutional reforms in accordance with the Maputo Declaration of the African Ministers of Agriculture, including reforms to macro-economic policies, legal frameworks and organizations for agricultural water*». Some guiding principles for setting a framework for investments in sustainable AWM in Africa include:

- ***Need for national AWM strategies and action plans*:** that show how investment in agricultural water can best contribute to agricultural productivity growth and poverty reduction. The strategies should also analyze the various investment options, including:
    - Increasing the productivity and profitability of existing irrigation schemes;
    - Expanding or developing new viable large, medium, small, and micro-scale irrigation systems (including systems based on water harvesting);
    - Testing and dissemination of viable, farmer-financed in-field rainwater management technologies as a low-cost alternative to irrigation;
    - Developing sustainable supply chains for micro-scale irrigation and in-field rainwater management equipment; and
    - Investing in research on agricultural water management, both adaptive research at the national and regional levels, and basic research at the regional level.

14 The strategy was first presented in a workshop that was held in March 2007 in Ouagadougou, Burkina Faso. The workshop was attended by over 130 experts and managers from 32 African countries and development partners with the aim to promote Agricultural Water Development (AWD) and to revitalize interest in AWD in Sub-Saharan Africa.

The new strategies should then be incorporated into wider sectoral strategies - for agriculture, rural development, and water. The whole should then be clearly reflected in PRSPs or similar national development strategies.

- ***Investment in AWM must consider imperatives of Farm-level profitability, viability and sustainability and gender issues as well:*** AWM investments need to be economically viable, financially profitable, and socially and environmentally sustainable. Future designs and investment decisions including those for major infrastructure should be based solely on considerations of economic viability, farm level profitability, and sustainability. However, where 'downstream' benefits can be quantified these should be taken into account in the analysis. Similarly, where there are opportunities for multipurpose investments these should be taken advantage of and accounted for in project costs and benefits. Poverty reduction and gender inclusion objectives of investments need to be clearly defined and demonstrably supported by intended activities, inputs and outputs of projects.

- **Women are stakeholders in agricultural water management and a poverty target group.** The impact of AWM on women is generally positive but there are specific problems of participation and equity for women.

- ***Promoting institutional and policy reforms:*** New investments have to take on board the fundamental lesson of the past: that only the empowered farmer with a share in decision making will invest and produce as expected. Thus, macro-economic and sectoral policies, legal frameworks and organizations need to be in place that define and deliver an efficient role for government, promote private sector and farmer investment, empowerment and cost sharing, and provide for efficient management of irrigation scheme.Thus, water investment strategies, and related agricultural water strategies, need to ensure that institutional aspects such as legal frameworks for land and water entitlements and for farmers' organizations participation and empowerment are analyzed and constraints taken into consideration; in particular the policy and institutional reforms and capacity building under which the changing role of concerned government institutions and involvement of local actors will take place.

- ***Ensuring integrated Water Resources Management****:* it is necessary to ensure IWRM from the river basin level to the end users. Thus, as most rivers in Africa cover international boundaries, with the major basins having more than four riparian countries, cooperation among concerned countries and shared strategic vision in common water resources management is key element for a sustainable development. Given the predominant role of agriculture as a water user, agricultural water investment plans need to be well articulated with the overall water resource planning and management process at country, sub-basin and basin levels. For countries that have a high dependence ratio such as Mali, Ghana, Mozambique, Niger, Egypt, Sudan and Chad, a Transboundary Integrated Water Resources Management (TIWRM) approach for shared water resources should be the guiding principle in water allocation decisions**.**

- ***Ensuring effective and successful implementation:*** implementation needs to be efficiently directed towards the bottom line of increasing farmers' incomes sustainably, and management arrangements need to be determined on the basis of the most cost effective approach.

- ***Adaptation to climate change:*** Climate change has become a global theme currently receiving considerable discussion at the regional and international levels. The climate variability and climate change agenda and the water development agendas cannot run in parallel or in isolation from one another. Strategy refinements are needed to bring the two communities much closer together.

Based on the analysis above and lessons learned, AWM within CAADP will likely consist of any or a combination of the following broad areas of focus. However, one should keep in mind that different countries have different opportunities and constraints and the emphasis on one area of focus on another will certainly differ:

- **Promotion market oriented AWM on a Public Private Partnership (PPP) basis**: Past experience is that medium and large scale irrigation development presents enormous challenges to African governments but that partnership approaches between the public and private sector can develop successful commercial irrigation. The range of institutional options is broad, from private sector 'third party' management of public schemes (as now proposed in Ethiopia) to simple facilitation by government or private sector investment, as in Zambia. One attractive model of PPP is the Green Scheme in Namibia, where since 1994 government has developed basic water delivery infrastructure and allocated 50% of the irrigated area to larger scale farmers who then provide water and other services to smallholder commercial farmers.

- **Promotion of individual smallholder irrigation for high value markets**: In areas close to urban or export markets, there has been considerable success with individual smallholder irrigation, usually based on pump technology, either manual or motorized. In Kenya, it is estimated that these systems benefit 300,000 households. Investment costs can be as low as $300-600/ha. An excellent example is from Niger, where the Niger Pilot Private Irrigation Project has spread a variety of manual and small-scale mechanized irrigation technologies, creating both a demand and a supply chain and a network of irrigator organizations. Manual pumping technology affordable to poor farmers allowed a doubling of the cultivated area and earned a 68% economic rate of return. This is a highly attractive business line that could be replicated and scaled up.

- **Development of Community Based Small Scale Water Control facilities**: Small-scale agriculture is the predominant form of agriculture on the continent at present, particularly in SSA, the majority undertaken without adequate water control. The strategic priority is to improve the reliability of these production systems. Small-scale community water control embraces inland valley/wetland cultivation *(dambos*), plain flooding/flood recession, and water harvesting. Crop productivity is low on the existing cultivated area with inadequate water control, thus further investment on those lands too, primarily to improve water reliability and control, could improve performance, if combined with input supply, linkage to markets, and farmers organization. Many opportunities exist for creating or improving small scale community-managed irrigation. Under the Ethiopia Social Rehabilitation and Development Fund, community-based irrigation, supplied largely from earth dams and river diversions, benefited 40,000 households, with visible improvement in the lives of villagers, including increased purchase of water pumps, milk cows and radios, as well as regular schooling for the children.

- **Expanding and developing areas under full water control:** The potential for further expansion of the area under full control of water is limited in North Africa countries but there is ample scope for expansion in sub-Saharan Africa countries particularly and in priority in Western and Eastern regions. However, there are limiting physical factors related to socio-economic and environmental factors particularly securing access to land and water and the profitability and sustainability conditions. Mali, Tanzania, Zambia, Niger and Ethiopia have potential for large water resources mobilization but very low levels of water infrastructure.

- **Improvement of the performance of existing irrigation schemes through rehabilitation and modernization**: Several countries in the region have invested heavily in large-scale irrigation. The Sudan Gezira scheme is the largest irrigation area in the world under single management – 880,000 ha. Madagascar, Sudan, Mali and Kenya have a history of large-scale irrigation that goes back 50 years or more. Yet it is hard to find examples of successful, or even adequate, results from these investments over the past decades, and there have been a number of spectacular failures. However, recent results, particularly from the Office du Niger in Mali, have shown that institutional reforms can make management accountable and obtain high rates of cost recovery. If associated with selective investment and profitable market opportunities, these reforms can make large scale irrigation schemes in Africa viable and sustainable. Given the large number of these schemes and their potential for contributing to poverty reduction and inclusive economic growth, this could be an important business line.

- **Improvement in water control and watershed management in a rainfed environment**: The potential for growth and poverty reduction through improved rainfed agriculture is theoretically vast: more than 80% of the region's households are rainfed farmers. Projects in several countries have developed profitable technologies, although there is little evidence that these technologies are readily adopted spontaneously. Scaled up at the catchment level, these technologies also form an important part of soil and water conservation programs. Given the potentially high gearing of success and the important environmental benefits, it is expected that this will be a business line at both pilot and full scales.

- **Enhancing water affordability and reliability through increased water storage capacity for multi-purpose use:** All the projections for future water demand in Africa, from various sectors (water supply, agriculture, energy and environment) will increase sharply, because of rapid population growth and rising per capita water consumption. FAO forecasts that irrigation water withdrawal in SSA would increase by 45 percent by 2030 (from about 100 km^3 to 145 km^3). IWMI and IFRI simulations predict that water supplies in agriculture will have to be augmented by an additional 20 to 30% over the next decades. It is inconceivable that countries in sub-Saharan Africa, can hope to cope with future demand without investing in additional water infrastructure including water storage facilities. In addition there will be a demand for environmental uses that should be taken into account at an early stage of project design. As a result, although a number of North Africa countries (Tunisia, Morocco, Algeria) are approaching or have passed deficit levels in their utilization of water (Egypt, Libya), in SSA, by contrast, except The Republic of South Africa, water resources so far mobilized for agricultural use are generally small in respect of the total annually renewable resource. On this basis, there would appear to be room for increase of water storage capacity, although increases in existing levels of agricultural use will have to be negotiated with other concerned sectors (water supply, energy, industry) and take ecosystems safeguard into consideration according to international standards.

- **Institutional development and capacity strengthening:** Institutional development and capacity strengthening in support of AWM will be of vital importance for achieving the sector goal of agricultural intensification. The development of policies, organizations and skills is a major key for success of AWM in Africa. The most important institutional development components are likely to include:
    - Support to the development of national irrigation strategies and a conducive policy environment for investment in irrigation;
    - Support to strategies and planning at the basin scale;
    - Capacity building exercises and information sharing at the national, sub-regional and regional level;
    - Capacity and institutional strengthening at the local and national level (including water users associations), in particular on issues related to sound irrigation development, processes for stakeholder involvement and strengthening of stakeholder groups;
    - Support to regional organizations such as ECOWAS, COMESA, SADC, CILSS, IGAD, ECCA, ARID and SARIA;
    - Support to national associations of irrigation professionals and irrigation champions, in particular in their engagement in the preparation of national poverty reduction strategies;
    - Networking and donor coordination activities;
    - Knowledge generation and dissemination through studies, workshops etc.

Box 8: Examples of smallholder irrigation and water harvesting

In many cases, the development of small areas by individual smallholder irrigators using micro-irrigation technologies (such as treadle pumps) is appropriate. Such investments are likely to involve lower capital and O&M costs compared to new or rehabilitated irrigation schemes and may be justified by the production of lower value crops. Cropping patterns could include rice and other cereals, cotton, dry beans, fodder and in some cases horticulture. Average land holding could be similar to that for new irrigation and the total numbers of direct beneficiaries could be of a similar order to those from investment in the rehabilitation or upgrading of existing but unused irrigation schemes perhaps 4 million households throughout the region.

TANZANIA: In Tanzania, water harvesting is used successfully on a large-scale for growing rice (Hatibu 1999). Indian migrants are believed to have introduced the so-called majaluba rain-fed rice system in the 1920s. It is used in the lowlands, where seasonal rainfall can be as much as 600-900 mm and runoff naturally collects in the valley bottoms making it ideal for paddy rice. Its adoption was not led by external change agents and was not fostered by external subsidies, but nevertheless it has spread steadily. Official data now show that the majaluba systems contribute 35 percent of total rice production in Tanzania. Recent research has been carried out to try and introduce micro systems in the drier areas for maize production. The idea is that micro systems would give smallholders more control over their farms. However, when they were invited to evaluate the micro-catchment trials, farmers understood the benefits of rainwater harvesting but were reluctant to adopt the system. They were more interested in the greater potential of using macro-catchment systems and argued in favour of more ambitious attempts to harvest runoff on a larger scale. So far the limited trials with macro systems for maize are mixed. Proper control over distribution of harvested runoff within the cropped area is more problematic for deficit-irrigated crops than is the case with majaluba rice systems. There is also clear evidence that failure to provide proper control over the distribution of runoff can lead to serious erosion. Too much water can be as big a problem as too little. The need for cooperative group action can also give rise to disputes over water sharing. Whether farmers will continue to prefer macro-systems to micro-systems as they acquire more experience in using them for maize production remains to be seen. However, one significant outcome of the research is that government sees runoff as a benefit rather than just a hazard and the cause of soil erosion. Development of rainwater harvesting is to be included in the Tanzania National Water Resources Management Policy.

Source: FAO, 2001. Smallholder irrigation technology: prospects for Sub-Saharan Africa

NIGERIA: Farmers in northern Nigeria lost their traditional use of the fadamas along the rivers following the construction of dams to control the river floods for urban water supply and irrigation. As an alternative, they turned to small-scale irrigation using shallow groundwater recharged by the river and lifting it by shadouf or calabash in the dry season to grow vegetables for local and city markets. In the early 1970s, a few farmers bought small pumps from private traders. In 1982-83, an agricultural development programme based in Kano sold over 2,000 pumps for cash to individuals or small farmer groups. Engineers introduced low-cost well technologies from India, which reduced well construction by two thirds with a commensurate increased return on tube well investment. This has been one of the most successful irrigation developments in Nigeria, with thousands of pumps being used by private farmers. Maintenance is well established, giving farmers confidence in the technology. However, external monitoring was necessary to avoid depletion of the aquifer. Interestingly, in the 1980s, some farmers started to grow wheat on the fadamas in response to the high wheat prices in the country. A useful example of the way in which private farmers can and will respond to the market if the price is right.

Source: FAO, 2001. Smallholder irrigation technology: prospects for Sub-Saharan Africa

SENEGAL: Although communal schemes present a higher risk than individual schemes, there are examples where they work well. In Senegal, small village schemes of 20 hectares or less have been constructed along the Senegal River. These usually comprise 40-80 plots of equal size supplied by an open channel system fed by 15 kW (20hp) engine pumps from the river. It was important for farmers to find a way to stabilise rice production in areas where they no longer had easy access to the flood recession fields along the riverside. In most cases, the farmers lived in the same village and worked together on the common objective of solving the rice problem with irrigation. The farmers, who invested labour in clearing bush and digging canals, constructed the schemes in part. They usually requested assistance from the local government irrigation agency and this usually resulted in the provision of a pump-set, pipes, site survey and equipment for construction using funds from aid donors. There was resistance to this farmer-initiated idea at first because of government plans for large-scale schemes in the area. A Presidential decree recognised the benefits of technical assistance for irrigation and the importance of meeting farmer demands rather than imposing a solution. Over the past 15 years, at least 700 schemes have been built. Production has remained predominantly subsistence-oriented even though attempts were made to extend irrigation to cash crops. Increasing farmer holdings did not encourage farmers to grow cash crops and they continued to grow rice in the rainy season and maize for cattle food in the dry season. Infrastructure on the schemes is co-owned by farmers. Rotation of water supplies is a recognised way of sharing out the available supply. Repair and maintenance is handled in the same way as construction. The elements that make these schemes work well include:

- Construction through investment of labour by farmers, albeit using donor funded equipment
- Selection of sites not usually used for agriculture
- Pursuit of an economic objective, in this case rehabilitating a farming system under duress
- Full autonomy for each village scheme (hydraulically, operationally and managerially)

Source: Diemer and Huibers, 1996

CHITORA, ZIMBABWE: A small scheme irrigating only 9 hectares with drag-hose sprinklers is one of the most successful farmer-managed irrigation schemes in the country. In operation since 1994, it is run by young people aged 22 to 27years who were without jobs and dependent on their parents. While the parents felt they were too old to engage in irrigated agriculture, 18 younger people accepted an offer of irrigation support from Agritex, the government irrigation development agency. Agritex provided all the inputs for the scheme including those for the first growing season. From then on the young farmers had to finance the scheme themselves. They were involved at every stage of development from planning to implementation and now have full responsibility for operation and maintenance. The cropping programme is essentially for high value horticultural crops grown for the markets on the outskirts of Harare, where there is a demand for good quality vegetables. Grain maize is not grown because farmers argue that it is cheaper to buy it elsewhere than to produce it themselves. The argument is based on the principle of opportunity cost. Farmers' income averages Z$60,000 per year compared with that of Z$16,800 for unskilled labour wages in the town. The farmers see no reason to migrate into the towns where they are well

aware that their costs of living would be much higher. The scheme is entirely farmer-managed through a system of bye-laws enforced by an Irrigation Management Committee that is responsible for coordinating all scheme activities including payment of bills for electricity, maintenance work, monthly subscriptions from farmers, maintaining discipline in the scheme and reallocating plots. The farmers continue to receive support from Agritex in the form of training and extension services. The successful performance of the scheme is a result of the farmers' sense of ownership and their belief that the scheme belongs to them. It is not possible to say what role technology played in this success. Undoubtedly water management was made easier to deal with and the availability of spare parts and technical support in Zimbabwe must add to the security of farmers using such systems.

Source: FAO, 2001

3.4.3 Technology

SLM and related water strategies are meant to address the challenge of improving the profitability and viability of farm and pastoral enterprises while managing and enhancing the supporting natural resources to effect win-win situations and enduring results. Africa has a growing body of experience with successfully combining such technologies and practices (see Box 5), which are typically site-specific, based on local innovation, development and adaptation. While such efforts are believed to have had a positive environmental impact, the primary motivation for their adoption was that the land users expected to obtain tangible on-site production benefits.

Recognising that there is no miracle solution to solve the problems of land degradation and low productivity, the selection of appropriate SLM approaches and water strategies for a particular area will be determined by: (i) the qualities and characteristics of the local land and water resources; (ii) the requirements of the land use enterprises to be pursued; and (iii) the socio-economic context and priorities of the land users.

While the emphasis of such approaches should be at a landscape level, it will still be based on gaining incremental improvements within the land use farming system through combining technologies and practices that will result in *improved plant*[15] *management* (e.g. higher yields, good vegetative cover, reduced raindrop impact), *improved soil and nutrient management* (e.g. higher organic matter levels, integrated plant nutrition, improved soil structure, good rooting conditions) and *improved water management* (e.g. reduced runoff, increased infiltration, improved irrigation efficiency, improved soil moisture conditions, etc). There are synergistic benefits from combining many of these, which can be expected to lead to even greater production and environmental benefits than each one on an incremental basis.

From a review of the baseline experiences with SLM and water strategies (see Section 3.2), it is clear that a number of common technical elements underpin the emerging win-win management options, notably:

- Minimum soil disturbance;
- Maintenance of good ground cover;
- Restoration of soil organic matter and related biological activity;
- Integrated plant nutrition management;
- Better crop husbandry;
- Development of integrated crop/livestock/agroforestry systems;
- Opportunistic, flexible, improved management of traditional pastoral systems;
- Small-scale community managed irrigation;
- Individual, market-driven investments by smallholders with low-cost technology; and
- Market links combined with reliable water supplies and delineation and management of protected areas.

Specific practices that can be used in combination to achieve sustainable land and water management (as shown in Annex 1) include those related to: (i) crop management (e.g. crop rotation and intercropping, integrated pest management, inter-planting with trees and agroforestry, mulching and residue management, etc.); (ii) pasture and rangeland improvement (e.g. planned grazing processes, enclosures for recovery or enrichment planting, fire prevention, etc.); (iii) forest

[15] Annual and perennial crops, grasses and other herbaceous pasture species, trees and shrubs

improvement (e.g. planting, natural regeneration, shelterbelt planting, fire protection, etc.); (iv) improved soil management (e.g. retention of crop residues and soil cover, additions of organic amendments including compost and manure and cover crops, integrated nutrient management, reduced tillage, etc.); and (v) improved rainwater management (e.g. contour ridges, natural vegetative strips, soil cover and residue management, reduced tillage, etc.) The table in Annex 1 also demonstrates the socio-economic and ecological benefits for the individual practices.

With such practices in hand, SLM and water strategy approaches reinforce the importance of people-centred approaches and adaptive management strategies needed to allow local stakeholders to adjust to change in terms of land use pressures and migrations, changing policies and effects of globalisation, climatic variability/change and effects of the disease pandemics and emergencies.

Introduction of small scale AWM technologies has led to rapid expansion and intensification of irrigation in some countries in Africa showing the existence of an enormous potential to successfully harness smallholder production. In other respects, a range of rainwater harvesting techniques has been utilised with success in West Africa (Niger, Nigeria, Burkina, Chad Cape Verde etc...) to stabilize and increase the yields of rain-fed crops. There is a wide range of established water management technologies (irrigation and rain-fed agriculture) that are water saving as well as having a good potential to allow a large number of small farm households to escape poverty. These technologies are easy to operate and maintain locally and appropriate to poor rural households. However, the key is to adapt them to local circumstances and to plan and implement them in the much broader framework of agricultural and rural development, in ways that yield optimal returns for poverty reduction.

3.4.4 Knowledge management and capacity building

Capacity strengthening in AWM: Institutional development and capacity strengthening in support of AWM will be of vital importance for achieving the sector goal of agricultural intensification. The development of policies, organisations and skills are critical for success of AWM in Africa. The most important institutional development components are likely to include:

- Support to the development of national irrigation strategies and a conducive policy environment for investment in irrigation;
- Support to strategies and planning at the basin scale;
- Capacity building exercises and information sharing at the national, sub-regional and regional level;
- Capacity and institutional strengthening at the local and national level (including of water users associations), in particular on issues related to sound irrigation development, processes for stakeholder involvement and strengthening of stakeholder groups;
- Support to regional organisations such as ECOWAS, COMESA, SADC, CILSS, IGAD, ECCA, ARID and SARIA;
- Support to national associations of irrigation professionals and irrigation champions, in particular in their engagement in the preparation of national poverty reduction strategies;
- Networking and donor coordination activities; and
- Knowledge generation and dissemination through studies, workshops, etc.

3.4.5 Investments and financing

Tackling bottlenecks to bankable projects: Initiate dialogues over bottlenecks in the process of bankability, notably: (i) the commonly arising gap between African propositions and the responses of financers; (ii) incentives and disincentives to investment in agriculture; and (iii) the agricultural policy targets that development partners intend to support.

Public-Private Partnerships (PPP): Create a more coherent policy framework for public-private partnerships that will attract increased private capital into the agriculture sector. Review existing infrastructure funds and facilities as well as private sector development initiatives (e.g. PIDG) in light of their potential support to the AWM sector.

Closing the finance gap: This will include: (i) water investments under the Maputo public expenditure pledge to be carried through; (ii) explicit statements by development partners on financial

contributions to drinking water and sanitation can be matched by equivalent statements in agricultural water management; (iii) an urgent implementation response to disbursement of 2008 Food Price Crisis pledges; (iv) response to the 2008 India-Africa summit; (v) investments into small-scale water control through national rural development and food security programmes in conjunction with the IFIs, IFAD, bilateral organizations and NGOs; (vi) leveraging of co-financing, especially from the private sector; (vii) leveraging finance from the numerous investment and public-private partnership funds and facilities that target African infrastructure; and (viii) a better understanding of the scale of private investments into irrigation, currently largely unmonitored. In some countries, rates may be at least as high as government investments.

4.0 Emerging issues

4.1 SLWM and climate change

Climate variability and change pose major threats for African countries, especially where there is high dependence of economies and rural people on rain-fed agriculture. The prevalence of poverty and food insecurity coupled with limited development of institutional and infrastructural capacities in most African countries make coping with natural climate variability a perennial challenge. This is being magnified by global climate change, which is predicted by many models to have some of the most negative impacts on agricultural production in tropical and sub-tropical regions, especially in parts of Sub-Saharan Africa (Cline 2007; Lobell 2008). Higher temperatures in most countries in the region cause increased evapo-transpiration, shorter growing periods, drying of the soil, increased pest and disease pressure, shifts in suitable areas for growing crops and livestock and a number of other serious problems for agriculture. Climate change is also expected to cause increased variability of rainfall and increased intensity and frequency of extreme events, including droughts, floods and storms.

According to HadCM3-A1F1 projections for 2080, all regions of Africa are likely to experience increases in severe environmental constraints for rain-fed crop production (Fischer et al., 2002). Northern, southern and western Africa is home to most of the land that is too dry for rain-fed production. These regions are predicted to face increases in the share of area too dry for rain-fed cultivation from 88 percent, 59 percent and 51 percent during 1961-1992 to 95 percent, 79 percent and 54 percent by 2080, respectively. Moreover, model scenarios project a decrease in land area with no constraints or only slight constraints for all regions of Africa, with the southern region expecting to see a decrease of up to 90 percent according to the most pessimistic scenarios (Fischer, Shah, and Van Velthuizen, 2002).

Concerted and effective responses by governments, civil society, the private sector, communities and individuals are necessary to address the challenges posed by climate variability and change. At the global level, much emphasis has been placed on mitigating climate change caused by emissions of greenhouse gases (GHGs) through international actions to implement the United Nations Framework Convention on Climate Change (UNFCCC), particularly through the Kyoto Protocol, as well as other government and private mitigation initiatives. Despite these actions, it is now widely recognized that it is unlikely that levels of emissions can be kept low enough to avoid significant adverse impacts from global warming. As a result, the need to adapt to climate change is becoming increasingly necessary as well, although less progress has been made toward international action to address this need.

Payments for environmental services (PES) is a relatively new source of funding, which although small in scale in Africa at present, has considerable potential for expansion as part of a comprehensive programme for SLWM. In the African context, most promising may be the transfer of funds from outside of the region to pay for globally important services such as biodiversity conservation[16] or carbon sequestration[17]. The World Bank Carbon Finance Unit is promoting the use of money contributed by governments and companies in industrialised countries to purchase project-

[16] In this regard the Wildlife Foundation in Kenya is securing animal migration corridors on private land through conservation leases at US$4 per acre per year.
[17] Principally, by paying for reforestation programs, which qualify for carbon credits under the Kyoto Protocol.

based GHG emission reductions in developing countries and countries with economies in transition[18]. Other opportunities need to be explored such as encouraging water companies, industry and irrigation schemes to provide financial incentives for land users in upstream catchment areas to adopt environmentally sensitive land management practices for the maintenance of water quality and quantity.

Sustainable land and water management measures are also essential to address problems of land degradation and associated poverty and food insecurity, as prioritised by countries that ratified the UNCCD, as well as to protect and preserve biodiversity, as prioritised under the UN Convention on Biological Diversity. Hence, there is potential to pursue several critical objectives synergistically through promotion of SLM and water strategies in Africa, especially in the Sub-Saharan region, helping to mitigate and adapt to climate change while reducing land degradation, conserving biodiversity and combating poverty and food insecurity.

4.2 Demographic pressure

According to UN projections, in 2004 Africa was home to some 906 million inhabitants. By 2015, that population is expected to swell to some 1.1 billion people. The economic, environmental, social, political and moral consequences of such population increases will be felt in all sectors of economic and social development.

The emphasis put on increasing agricultural production mostly through the use of marginal land coupled with the lack of a timely implementation of a family planning program and a national population policy has led to a worsening of the interactions between population growth, land use and the environment.

Already some 39 percent of land on the African continent is degraded. Two-thirds of arable land is expected to be lost by 2025 if population growth continues at its current pace and unless vigorous action is undertaken to slow down this process. As a reminder, it is human activities that cause impoverishment of the soil, in particular through: (i) deforestation and land clearing; (ii) bad agricultural practices that cause erosion; (iii) overgrazing; and (iv) the over-exploitation of trees and shrubs for domestic uses, animals straying and bush fire. Political instabilities, conflicts and migrations reinforce the harmful effect of men on natural resources.

4.3 Green revolution

Learning from limitations of the original Green Revolution approach: The original Green Revolution approach with a reliance on the use of hybrid seed, mineral fertilisers and mechanisation largely failed to tackle the problems of low crop productivity in Africa. This was due to the approach's high and costly inputs, top-down approaches, requirements for good governance and lack of interest of the agricultural sector.

While there were unprecedented yield increases when first introduced, advocates of the original Green Revolution did not recognise the importance of maintaining soil health (essential for the growth of healthy crops) or the need for a broader ecologically-based SLWM approach that is able to prevent or correct, adverse changes in biological, chemical, physical and hydrological soil properties. In other words, while the old Green Revolution may have rapidly improved production, it depleted the resource base that was required to support it long-term. It is time to include best practices and lessons learned from these experiences in order to transcend to a more sustainable and transformative approach.

The Green Revolution in Asia could not have happened without massive flows of water irrigation water to bring the best out of the new crop varieties and other inputs that were also made available to

[18] There are Emission Reduction Purchase Agreements ongoing in Uganda and South Africa and other initiatives under development in DR Congo, Ethiopia, Kenya, Madagascar, Mali, Niger, Uganda and South Africa. Most of these are being developed to address land degradation issues, for instance in Democratic Republic of Congo, Ethiopia, Kenya, Mali, Niger and Uganda payments are being made for afforestation, while in Madagascar a community-managed forest protection programme is under appraisal.

farmers. Nor would it have been possible without massive flows of investment capital to build new irrigation schemes and expand existing ones as well as to fund the provision of other infrastructure and services to rural areas, including research and extension. AWM, then, is an essential part of the package of technologies, institutions and policies that underpins increased agricultural output in Asia. Nowadays, there is general consensus among decision makers in African countries and donor partners that without increased investment in Agricultural Water Development and better water management most of the countries in Africa, particularly in sub-Saharan Africa, will not achieve the Millennium Development Goals related to access to water and sanitation, energy and future food demand to eradicate hunger. Hence, the MDG targets cannot be reached without large investments in Agricultural Water Development.

Building the potential for a new Green Revolution approach: Improving the performance of the agricultural sector within Africa requires a new Green Revolution, one that will incorporate the best elements of technologies from the original Green Revolution (notably improved crop varieties and livestock breeds) into the more holistic SLWM approach, placing the social and environmental aspects squarely in the management approaches. This renewed version of the Green Revolution must involve a very clear and coherent integration of the environmental and agricultural agenda and sectors. The focus for the new approach should be on intensifying the productive capacity, while maintaining the protective functions of healthy ecosystems, with the aim to maximise the range of goods and services that can be realised from the sustainable utilisation of the locally available ecosystem resources (climate, soils, water, vegetation, wildlife, etc).

Box 9: African Green Revolution initiative:

The Alliance for a Green Revolution for Africa (AGRA) is a recently established organisation aiming for a prosperous agricultural system taking into account the economic, social and environmental aspects required to double or triple farmers' yields. In Africa, use of mineral fertiliser averages only 8 kg per hectare, some 10 percent of the world average. The Abuja Declaration on *Fertiliser for the African Green Revolution*[19] called on AU member states to increase the level of usage to an average of at least 50 kg per hectare by 2015. To assist in addressing poverty, food security and other related MDGs, it is critical that any input such as increased fertiliser use is promoted as part of a holistic SLWM approach, rather than a stand-alone exercise.

Green/organic labels and certifications are predominantly aimed at regulating and facilitating the sale of organic products to consumers. These certification processes have been put in place for farmers and others involved in food production including seed suppliers, food processors, retailers and restaurants. Requirements vary by country and involve a set of production standards including avoidance of use of synthetic chemical inputs (e.g. fertilizer, pesticides, antibiotics, food additives, etc) and genetically modified organisms. With a tradition of low input agriculture in Africa, organic agriculture holds great promise[20], and there are already examples of certified organic and non-organic agriculture in the region.

Box 10: Examples of eco-tourism in Africa

Ecotourism in Africa has become big business. Aiming to improve conditions for the environment and people, it has become synonymous with adventure, nature and cultural tours for African vacations. For example, in Kenya, ecotourism has recently prompted a much greater market for the "green labels" among lodges and hotels indicating their responsibility in not degrading the environment but actually working to improve it[21].

The United Nations recognised the importance of the growing ecotourism business some time ago, by declaring 2002 as the International Year of Ecotourism. A number of NGOs, however, claim that ecotourism will increasingly result in a negative situation for nature conservation and local populations. For the last century wildlife conservation groups have been pressing for the establishment of national parks in Africa. But while the wildlife-based tourism industry has grown profitable, local people have not seen similar gains. In a bid to bring the profits from this kind

[19] Issued at the Africa Fertilizer Summit, African Union Special Summit of the Heads of State and Government – Abuja Nigeria 13 June 2006.
[20] http://orgprints.org/5161/03/parrot-et-al-2006-africa.pdf
[21] http://allafrica.com/stories/200708071127.html

of tourism closer to home, the Kenya Wildlife Services embarked on a 'Parks beyond Parks' programme in 1996, allowing local people to set up tented camps and other tourist activities in areas bordering national parks. The ECOTAF research project is concentrating on the effects of such ecotourism initiatives in the Selengei region bordering Amboseli National Park, Kajiado District.

4.4. Energy, food safety and security

Bio-energy may provide new markets for farmers producing agro-fuels. While the pros and cons of bio-fuel production relative to environment and food security benefits are still strongly debated, the production of secondary sources could hold opportunities for African farmers. If producing for such markets uses an SLWM approach, it could benefit the environment and increase food security, for example if smallholders farmed bio-crops and biomass as a source of energy for themselves and their local communities or contributed to commercial production for national or international markets. Additionally, some bio-crops can provide further benefits such as windbreaks, restoration of degraded areas, habitats for native biodiversity and a range of ecosystem services[22].

Fair-trade has emerged as one of the fastest growing consumer movements in Europe and North America. As a result, today more than 5 million people farmers, workers and their families across 58 developing countries benefit from the international Fair-trade system. A recent survey estimated that British shoppers will spend £2 billion on Fair-trade, organic and locally sourced products in 2007, an increase of 62 percent since 2002. Fair-trade roast and ground coffee now accounts for about 20 percent of the UK market and the number of Fair-trade accredited products rises year by year[23]. There is a growing number of African farmers who are benefiting from a fair trade premium on their products[24]. Fair-trade typically involves building human and social capital in participating communities as well as promoting good farm management practices, with the emphasis on long term sustainable production.

Food safety and good agricultural practice (GAP) protocols evolved in recent years in the context of a rapidly changing and globalising food economy and concerns about food production, security, safety and quality as well as the environmental sustainability of agriculture across the food chain. The GAP approach has implications for agricultural production and post-production practices and offers the opportunity to address sustainable use of resources. Its use is also being promoted increasingly by the private sector through informal codes of practice and indicators developed by food processors and retailers in response to emerging consumer demand for sustainably produced and wholesome food. This trend may create incentives for the adoption of GAP by African farmers, provided that they have the capacity to respond[25] to that demand.

4.5. Foreign demand for land

Large-scale foreign land acquisitions constitute major and real concerns for African population. Most of these overseas investments come from China and the Gulf States as well as other private investment (IIED, FAO and IFAD, 2009) and have affected primarily Mali, Senegal and Burkina Faso.

Several factors seem to underpin these land acquisitions. These include **food security concerns**, particularly in investor countries, which are a key driver of government-backed investment. Food supply problems and uncertainties are created by constraints in agricultural production due to limited

[22] From FAO 2007, http://www.fao.org/newsroom/en/news/2007/1000540/index.html
[23] Figures taken from a special supplement, *Fair Trade – A force for social change,* published in the UK Guardian Newspaper, March 2007.
[24] Examples include: (i) the Cooperatives des Producteurs de Coton de Dijidian, Keita Mali who are supplying fair trade cotton to Sainsbury's a UK based supermarket; (ii) the Abahuzamugambi Bakawa coffee cooperative in Rwanda was due to be paid (in 2007) a premium price of $1.65 a pound for their green Maraba coffee beans by the UK based Union Coffee Roasters; and (iii) the Kagera Co-operative Union (KCU) which is made up of 90,000 small-scale coffee growers in north-west Tanzania supply part of the fair trade coffee marketed by Clipper and M&S in the UK, and the KCU has been able to invest some of the fair trade premium into an instant coffee factory (allowing farmers to sell their low grade, non-exportable coffee, within Tanzania) and to fund three schools and attract quality teachers.
[25] FAO promotes Good Agriculture Practice http://www.fao.org/prods/GAP/index_en.htm

availability of water and arable land, by bottlenecks in storage and distribution and the expansion of bio-fuel production, which is now becoming an important competitor for land used for crop and livestock production.

Some difficulties for African countries associated with these new land deals include:

- Host country benefits are mainly seen in the form of investor commitments on investment levels, employment creation and infrastructure development though these commitments tend to lack teeth in the overall structure of documented land deals.
- Although on paper some countries have progressive laws and procedures that seek to increase local voice and benefit, big gaps between theory and practice, between statute books and reality on the ground result in major costs being internalised by local people – but also in difficulties for investor companies.
- Many countries do not have in place legal or procedural mechanisms to protect local rights and take into account local interests, livelihoods and welfare**.** Even in the minority of countries where legal requirements for community consultation are in place, processes to negotiate land access with communities remain unsatisfactory.
- Lack of transparency and checks and balances in contract negotiations create a breeding ground for corruption and deals that do not maximise the public interest. Insecure use rights on state-owned land, inaccessible registration procedures, vaguely defined productive use requirements, legislative gaps and compensation limited to loss of improvements like crops and trees.

Table 2: Sample of Land Deals

Country	Contract
ETHIOPIA	Land Contract between the Benishangul Gumuz Regional State Administration and Alemitu Negash, signed on October 20, 2008 (original in Amharic, contract examined through an English translation undertaken by the study; the date on the contract is 10 October 2001 following the Ethiopian calendar).
MADAGASCAR	Contract Farming Agreement between Varun Agriculture SARL and association from 12 plans (Bemanevika, Bekapila, Mahatsinjo, Ambohitoaka, Mahadrodroka, Manandriana, Ankaizina i, Ankazina ii, Bealanana, Maevarano, Amparay, Ankobalava, Ampatsifatsy) in Sofia Region, signed on January 26, 2009 (accessed in English translation only).
MALI	Draft Convention between the government of the Republic of Mali and the West African Economic and Monetary Union (UEMOA) concerning the terms of the allocation of two plots in the Office du Niger area as well as the roles and responsibilities of actors involved in their development (original in French); Draft Lease Contract between the Office fu Niger and Petrotech/ AgroMali SA (original in French).
MOZAMBIQUE	Model provisional allocation of a “land use and benefit right” (DUAT; original in Portuguese).
SUDAN	Special Agricultural Investment Agreement between the government of the Arab Republic of Syria and the government of the Republic of Sudan signed on May22, 2002 (original in Arabic, contract examined through an English translation undertaken by the study).

Source: FAO, IIED and IFAD, 2009

Box 11: Examples of land acquisitions in Africa

Major private land deals have involved both agri-food companies and bio-fuel developers. Examples include:

• A consortium of Saudi agricultural firms called Jenat recently announced plans to invest US$ 400 million into food production in Sudan and Ethiopia, following investments in 10,000 hectares of barley, wheat and livestock in Egypt according to company sources (Reuters, 2008f and 2009c);

• Another private Saudi consortium recently announced a lease of unspecified size in Ethiopia (Reuters, 2009d);

• The pan-African conglomerate Lonrho acquired 25,000 hectares in Angola and is negotiating major land deals in Mali and Malawi (Burgis, 2009);

• GEM Biofuels plc gained exclusive rights for 50 years over 452,500 hectares in Southern Madagascar to plant jatropha for bio-diesel production (Reuters, 2008a); and

• A UK energy company CAMS Group announced in September 2008 the acquisition of a lease over 45,000 hectares of land in Tanzania for investments in sweet sorghum production for bio-fuels, through equity financing and lending from a

commercial bank in London (Reuters, 2008e).

5.0 Operationalization of the framework

The CAADP Pillar 1 Framework on SLM and water strategies is expected to serve agriculture productivity interests as well as environmental resilience and bio-diversity protection objectives. This cuts across specific interests and framework requirements for NEPAD's CAADP and the Environmental Action Plan (EAP) as well as the broader TerrAfrica support framework.

The CAADP roundtable processes and overall CAADP framework provide the main frame for the adaptation and application of the CAADP Pillar frameworks. Hence, there are deliberate efforts to ensure that country and regional CAADP teams input are oriented to the Pillar 1 Framework.

The CAADP Pillar 1 Framework also recognises the issues and uniqueness in the strong linkages between agricultural objectives and natural resource/environmental resilience objectives. Therefore, in terms of delivery mechanisms, it is noted that institutional arrangements and modalities for implementation of environment and natural resource management investment programmes will also apply the framework to their development initiatives.

In operationalizing the CAADP Pillar 1 Framework, focus will be placed on:

- ***Addressing knowledge management and M&E barriers*** – through filling knowledge gaps and improved management of knowledge collection, storage, analysis and dissemination.

- ***Addressing institutional and governance barriers*** – through: (i) multi-sectoral and inter-agency stakeholder partnerships at regional, country and local levels; (ii) awareness raising and consensus building on a common vision for SLM with a recognition that agricultural water is an important cross-cutting element; (iii) building capacity amongst planning, research and advisory service providers at central and local levels; and (iv) decentralisation to address area-specific problems and take advantage of local development opportunities.

- ***Addressing financial resource bottlenecks*** – through increased and harmonised government, donor and private sector investments within a comprehensive strategic planning framework and portfolio of related priority projects and programmes.

- ***Addressing legislative and regulatory barriers and bottlenecks*** – through review, harmonisation and revision of the legislative and regulatory environment for SLM practices and related water strategies.

5.1. Continental and regional levels

At the regional level, successful operationalization of the framework will involve a number of supporting activities, including:

- ***Building regional consensus and understanding about SLWM*** – through consultations (workshops, e-mail conferences, etc) with senior policy-makers and technical experts in the key national, sub-regional, regional and international level stakeholder institutions, as one of the barriers to mainstreaming SLWM at the country level is a lack of a common set of principles[26] among partners.

- ***Undertaking a region-wide awareness raising/consensus building campaign*** – on the fundamentals of CAADP Pillar 1, in order to get senior officials and decision-makers at the national level and within multi-lateral, bi-lateral, international and regional development agencies to "buy in" and drive the regional partnership.

[26] Including as yet no universal definition of what sustainable land management is, despite it being the focus of the GEF OP 15 and TerrAfrica.

- ***Building African-owned coalitions and strategic partnerships for SLWM*** – at regional and global levels, in order to develop inclusive regional dialogue and advocacy on strategic SLWM priorities, thus, enabling conditions and delivery mechanisms.

- ***Developing a regional coalition of countries*** – through careful initial country selection and engagement based on current levels of interest within potential partners and their capacity to undertake national road map activities.

- ***Developing a Strategic Investment Program (SIP) for SLWM in Africa*** – to provide a programmatic financing mechanism for GEF resources aimed at rapidly scaling-up SLWM on the ground in Africa.

- ***Developing a regional knowledge base*** – as an information resource for those involved in promoting SLWM at the local, national and trans-boundary levels. This knowledge base will be used to help: (i) support high-quality, regional knowledge-based mechanisms; (ii) identify and generate stronger analytical underpinnings; and (iii) harmonise the monitoring and evaluation systems of governments, donors and civil society groups.

- ***Developing generic Country Specific SLWM Investment Framework (CSIF) guidelines*** – for adaptation at the national level to scale up successful SLWM technologies and approaches with a particular focus on how to overcome local, national and trans-boundary institutional, policy, legal and financial barriers and bottlenecks.

- ***Developing generic M&E guidelines*** – for adaptation at the national level to monitor and evaluate the results and performance of country level supported activities.

- ***Providing a platform for delivering comprehensive support to agricultural water in Sub-Saharan Africa.***

- ***Leveraging the political dialogue and addressing international rivers riparian issues.***

5.2 National level

At the national level, successful operationalization of CAADP Pillar 1 Framework will involve a series of steps, each with its own set of activities to be undertaken at the national, district and/or local levels, including:

Step 1: Building national commitments and partnerships
- Building a broad based national coalition
- Sensitisation and advocacy
- Agreement to a common code of conduct

Step 2: Stocktaking, analysis and diagnosis of the in-country situation
- Documentation and assessment of SLWM technical interventions
- Ecosystem assessment
- Policy diagnosis
- Institutional diagnosis
- Financial diagnosis

Step 3a: Formulation of the Country Strategic Investment Framework
- Identification and priority setting
- Preparation of a preliminary CSIF outline
- Formulation and costing of the full CSIF

Step 3b: Formulation of national agricultural water development strategy

Step 4: Implementation of the Country Strategic Investment Framework and the AWD Strategy

5.3 Networking, awareness and advocacy

Sensitisation and advocacy – in order to raise awareness and build a national consensus amongst all stakeholders on: (i) the concepts and principles of SLWM as they relate to the local, district and national level environmental and socio-economic circumstances of the country; and (ii) the need to mainstream and scale up SLM and water strategies within a comprehensive national programme aimed at addressing land degradation, food insecurity and rural poverty. A key task for the country SLWM team at this stage will be to build the necessary political commitment and secure the increased public funding required to address the barriers and bottlenecks.

The strategic objectives of advocacy for SLWM are:

1. To mount an intensified campaign for enhanced awareness and sensitization of SLWM at local, national, regional and international levels ;
2. To define a road map for advocacy that encourages countries to put in place national policies and strategies for SLWM, as part of their general development programmes ;
3. To urge governments, development partners and other stakeholders to allocate more resources for SLWM ;
4. To strengthen networking and partnerships for collaboration and advocacy among stakeholders.

Advocacy, awareness raising and education form a main pillar of any strategic plan and framework to enhance the implementation of the SLWM. Effective awareness-raising for SLWM would involve enhanced advocacy, improved provisions for civil society participation and production of educational materials. There is need to:

- Deepen understanding among policymakers and key civil servants of the impact of SLWM on the economy, environment and natural resources as well as the social consequences of insufficient investment;
- Raise awareness among decision-makers and key civil servants about the potential returns on SLWM as well as of the disproportionate cost of "business as usual" compared to the cost of appropriate action in addressing land degradation and drought;
- Promote recognition among political decision-making circles of the whole range of global benefits brought about SLM and water strategies; and
- Deepen understanding among political decision makers and leaders of how SLWM can contribute to addressing major global challenges.

5.4 Resource mobilisation

5.4.1 Resource mobilisation for SLM

Payment *for environmental services (PES):* a relatively new source of funding that although small in scale in Sub-Saharan Africa at present has considerable potential for expansion of SLM. As mentioned earlier, the most promising element of PES is the funds transfer from outside of Africa to pay for services such as biodiversity conservation[27] or carbon sequestration[28].

Eco-tourism: defined by the International Ecotourism Society as "responsible travel to natural areas, which conserves the environment and improves the livelihoods of local people." There is strong consumer demand for ecotourism products (see Box 10), with a forecasted dramatic growth for this sector, globally. While the game parks in countries such as Kenya, Tanzania and South Africa are well known and already attract a significant number of overseas visitors, there are many other natural areas (both within and outside of officially protected areas) that could support eco-tourism with the revenues generated being used to fund local conservation and economic development. The key to sustainable ecotourism is sustainable ecosystem management and benefit with equitable benefit sharing among local populations. Without the biodiversity, there is no business, and this should

[27] In this regard the Wildlife Foundation, in Kenya, is securing animal migration corridors on private land through conservation leases at US$4 per acre per year.
[28] Principally by paying for reforestation programs that qualify for carbon credits under the Kyoto Protocol.

provide the incentive for those utilising and managing the resource for eco-tourism to reinvest in its conservation.

Environmental Interest Groups: – also known as green lobby groups are typically private sector environmental public interest groups that are promoting environmental protection, conservation and regeneration as a basis for future development actions and demanding such from governments. These groups are often well endowed financially and call for willingness to pay for sustainable land management to diminish the effects of climate change and enhance biodiversity, water quality and quantity, among others.

5.4.2 Resource mobilisation for water management

Until recently, investments in agricultural water in the region have been declining. Levels and trends of donor financing are conventionally taken as a proxy for investment levels. In the most recent three-year period for which partial data are available (1994-1996), the total cost of projects funded by donors for irrigation and drainage was less than 10 percent of levels of 20 years previously — just $127 million from all sources.

Investment in agricultural water has received only a small proportion of that for the water sector as a whole. For example, African Development Bank lending for agricultural water over the period 1968-2001 was $630 million, which was only 14 percent of its lending to the water sector as a whole.

At least one-half of the water managed area is privately developed and operated. Privately developed and operated areas include some large-scale sugar estates in southern Africa, thousands of smaller schemes operated by large-scale commercial farmers and numerous informal smallholder schemes as well as many thousands of individually owned and operated areas (mainly gardens).

Implementing and managing public investments. Organisational arrangements for project design, implementation and management are more efficient when they reflect the comparative advantages of the public sector, farmers, NGOs and the private sector. Sustainability is best achieved by involving farmers throughout and by handing over schemes to farmer organisations once complete. In many cases, it can be more efficient to obtain implementation services from the private/NGO sector than to build public sector institutions for the purpose, even where local private/NGO sector capacities are weak.

6.0 Monitoring and evaluation

Monitoring and evaluation (M&E) is important for strengthening knowledge management, benchmarking and guiding design and implementation of individual investment operations in SLWM. At the country level, this helps strengthen coalition, enhances alignment around shared goals and vision, reinforces trust among actors and, importantly, supports implementation and coordination. No program level M&E may capture the full picture of each individual country or operation. Rather, individual project performance is best captured within those discrete projects' M&E systems, depending on country and local priorities. Each project's M&E should report on a minimum set of common strategic indicators agreed upon in advance. The program level should add value and allow for benchmarking, mutual learning via cross-fertilization of experience within the coalition and portfolio level reporting.

An M&E system should be formulated for the SLWM Investment Framework, starting with the selection of a shared set of measurable and cost-effective goals and indicators. This M&E framework will then help guide all related interventions in the SLWM Investment Framework. M&E elements including objectives, outcomes and indicators can be presented in a number of ways. Using various tools, they could include a combination of:

- Existing outcomes and indicators gathered from current projects and programmes;
- Additional or new outcomes and indicators gathered from new sources and further dialogue within the coalition and with partners;
- Indicators and targets that can be aggregated and disaggregated (not all indicators are able to be aggregated or disaggregated; some indicators will be locally specific); and
- Data sources and responsibilities identified.

Key suggestions and messages include:

- Implementation should be through existing delivery mechanisms, institutions and stakeholders;
- A strong investment portfolio requires strong M&E to support mutual learning and investment prioritization. M&E is not an "add-on" feature, but an integral part of the effort with great added value;
- M&E is critical for understanding what works and where, allowing for methodically up scaling successes;
- A dialogue should start as early as possible on common goals, objectives and ways to measure them. While preparing the Investment Framework, these metrics can be refined. This will help define the country's shared vision for SLWM;
- The country's SLWM Investment Framework must include quantified objectives and outcomes to the extent possible. These should be derived from existing operations, TerrAfrica's benchmarks and indicators and existing country monitoring systems. It may be useful to involve the country's spatial and statistical agencies. Targets can be adjusted as the development of the Investment Framework proceeds;
- A country knowledge base and/or management information system with GIS capabilities can be invaluable to track progress of the SLWM portfolio and the coalition; and.
- Development of M&E and knowledge management tools, capacities and IT will likely need financial support. These activities should be costed and included in the SLWM Investment Framework as early as possible, as it takes time to establish data collection and aggregation procedures.

The formulation of a country specific system for monitoring and evaluating the results and performance of national and local SLWM-related interventions can be implemented under the CSIF. This involves the identification of indicators that can be used to assess the outcome and impact of specific SLWM interventions at project and programme levels. This will be undertaken in collaboration with government M&E teams. It will also take into consideration the TerrAfrica indicators developed at the regional level, as to ensure a degree of commonality between the indicator sets used by different countries to allow for regional aggregation.

High level indicators of performance at national and regional level of areas under SLWM would include gathering evidence on:

- Numbers of people lifted out of poverty (income raised above US$1/day) through investment in SLWM
- Increase in production and value added through investment in SLWM
- Increase in land and water productivity resulting from investment in SLWM
- Increased flow of investment towards SLWM sub-sector
- Annual increase in area under SLWM (specify per type)

The success of the SLWM partnership will be measured not only by the evidence of improvements resulting from investments in SLWM but also by evaluating the contributions made by the components and activities undertaken by the partners. Evidence for this will include measurements at global, regional and country level in relation to advocacy, resource mobilization, harmonization, knowledge sharing and innovation.

Whenever possible, at national level and in the context of PRSP monitoring or sector programme monitoring, existing M&E systems with input-output-outcome-impact indicator matrices should be revised in order to incorporate SLWM indicators and targets.

Monitoring and evaluation of project performance has been neglected in the past and needs to be improved in future to inform future strategic planning and project design as well as to measure the contribution of SLWM to achievement of the Millennium Development Goals.

7.0 ANNEXES

Annex 1: Land Resources Underpin Social and Economic Development

The sources of wealth in Africa: Africa contains a great diversity of natural ecosystem resources[29] (soils, vegetation, water and wildlife), which constitute the region's natural capital assets. It is from these assets that the provision of goods (food, water, wood, fibre and industrial products) and essential ecosystem services and functions are drawn in order to support African populations into the future (see Box 1). Although not specifically established for Africa, globally, fundamental ecosystem services have been valued at US$33 trillion a year – just less than twice the global GNP of US$18 trillion (Costanza, 1997).

Box 12:Essential Ecosystem Goods, Functions and Services

- *Provisioning* - which provide the products extracted from ecosystems for human consumption (food security) and trade – food, water, timber, fuel, fibre, medicine, ornamental plants, etc.[30]
- *Supporting* - which include the basic natural processes that sustain life on earth – biomass and oxygen production, soil formation, carbon cycling, maintenance of biodiversity, etc.
- *Regulating* – which benefit humanity through the regulation of natural ecosystem processes – maintaining climate and hydrological cycles, water purification, break down of waste products, erosion control, prevention/mitigation of natural disasters (notably floods, landslides), etc.
- *Maintaining cultural* - which relate to the non-material benefits that ecosystems provide for society – recreation, aesthetic value, healthy environment, spiritual benefits, sense of belonging, social relations, prevention of land resource conflicts, etc.

Source: FAO, 2006

While Africa's non-renewable mineral resources (gold, oil, copper, etc) are highly valued and have attracted considerable investment, Africa's renewable land resources – those most critical to economic and social well being – have been largely undervalued, with inadequate investment from both the public and private sectors. Yet agriculture remains crucial for economic growth in Africa, being the largest contributor to GDP and providing 60 percent of all employment in most country. Agriculture is also the greatest source of foreign exchange accounting for 40 percent of the continent's hard currency earnings and serving as the main generator of savings and tax revenues. The agricultural sector is also still the dominant provider of industrial raw materials with about two-thirds of manufacturing value-added being based on agricultural raw materials (CAADP, 2002). Additionally, 70 percent of rural populations of Africa depend on forests or woodlands for their livelihoods – an important fact considering that the continent contains 25 percent of the world's remaining rainforest and 20 percent of the worlds' biodiversity hotspots (Costanza, 1997). Some 25 million pastoralists and 240 million agro-pastoralists depend on livestock (and thus fodder and rangeland) for their primary source of household income (ILRI, 2006).

Another primary source of wealth in Africa is derived from its people. It is the creativity, indigenous skills, knowledge and labour resources of its population, the crucial human assets of concerned communities that must be valued, supported and strengthened for managing Africa's land resources.

When the goods and services can be sustainably derived from a healthy and stable land resource, the stage is set for high productivity, increased GDP and employment, thriving businesses, increased export potential, food safety and security, human health and well being and harmonious and cohesive communities at all levels of society. When well managed, natural resources such as land have the potential to provide the wide range of sustainable livelihoods for different land users[31], accelerate sustainable rural development and enhance the quality of life for all society members. However, inappropriate land uses and poor land management practices have led to a decline in their

[29] Derived from variations in local climatic conditions, landscape features, soil properties, surface and groundwater resources, vegetation types, as well as wildlife resources.
[30] This includes realizing the potential economic and social benefits of particular areas from tourism through the preservation and development of wildlife habitats, scenic landscapes, and recreation opportunities.
[31] From small-scale subsistence farmers to large scale commercial farmers/estate managers, pastoralists, ranchers, foresters, hunter/gatherers, game farmers, as well as nature reserve managers and eco-tourism companies.

productivity and the capacity to produce goods and services, thereby leading to a reduction in their social and economic value for Africa.

Increasing Demand: While in many parts of the world population growth is declining, Africa is expected to grow at 2.1 percent per year to 2030, when globally every third person born will be a Sub-Saharan African. By 2050, this will rise to every second person. Already population growth has exceeded the growth of Africa's GDP (particularly agricultural GDP) so that the population as a whole has become poorer over the last two decades. Thus, a rise in population and the subsequent changes in consumptive patterns will place further and more severe demands on the continent's ecosystem resources. These will need to be better managed if the human requirements, goods and services of Africa's rural populations – 83 percent of whom live in extreme poverty – are to be met. Poverty, food insecurity, poor health, malnutrition and conflicts over scarce farmland, grazing, forest and water resources, as well as increased vulnerability to natural disasters, are the direct results of inappropriate development policies and programmes that have failed to invest in the sustainable management of Africa's ecosystem resources.

Meeting the demand**:** Rebuilding Africa's natural capital assets is a prerequisite for sustainable social and economic development. Meeting demand requires increased quality and quantity of goods and services. This means successfully tackling land degradation through promoting and up-scaling of SLM and water strategies on the ground. Likewise, social resources will need to be enhanced through building the social capital assets of community-based groups, indigenous social networks, local government and private sector support services. It will also require mainstreaming through integrating knowledge, expertise, participatory processes and reformed institutions and policies (particularly related to land tenure and markets) for long-term change. Implementing such a holistic SLWM programme holds promise for prosperous landscapes and livelihoods in Africa.

Investing to make a difference: Increased investment in agriculture[32] is increasingly recognised as key to reducing poverty and hunger, as it has been shown to have greater impact than equivalent investment in urban and industrial development (FAO, 2006). However, sustainable agricultural growth in Africa also depends on restoring, sustaining and enhancing the productive capacity of the continent's land resources. This has been largely over-looked and under-funded in past agricultural development strategies, which have taken land resources for granted rather than recognising them as valued productive assets that require improved care and management to fully realise their potential.

Within the overall vision of the NEPAD[33,] the vision for African agriculture[34] is to maximise the contribution of what is still the continent's largest economic sector. By 2015, the vision is to improve productivity of the agriculture sector to attain an average annual growth rate of 6 percent, thereby enabling the agricultural sector to provide the strategic basis for eradicating poverty, achieving food security and building the foundations of sustainable economic development (CAADP, 2002). However, turning such a vision into reality requires that rural households, private companies and state enterprises engaged in crop, livestock and forestry-based enterprises pursue environmentally sound production measures. This in turn requires the development of a supportive enabling environment through mainstreaming the concepts and principles of sustainable land management into central and local government rural development policies and programmes.

The Consequences of Land Degradation in Africa

> *"It's much harder to farm now than when I was young. We grow maize here to eat, and tobacco to sell, and vegetables, but the rains are affecting everything. We never had to apply fertiliser then, but now we do, and still we do not get as much from our crops as we used to. We are learning to grow different crops and to compost, but it's not enough."*[35]

[32] As advocated during the 2006 FAO World Food Day.
[33] Formally adopted at the 37th Summit of the Organization of African Unity in July 2001.
[34] As set out in the Comprehensive Africa Agriculture Development Program (CAADP 2002).
[35] The words of Denis James, a smallholder farmer with a family of 10, living in the village of Kholongo in central Malawi. From an article headed '*By November, people will start eating wild roots*' from the UK Guardian newspaper, October 25, 2006.

This Malawian farmer's experience reflects the reality faced by a growing number of rural poor in Africa. Some 59 percent of Africa's population live in rural areas and depend primarily on local land resources to meet their basic needs for food, fuel, water, shelter and cash. Increasingly, such households are finding their livelihoods adversely affected by land degradation and climate change. A variety of scientific studies back up farmers' anecdotal reports, confirming that the quality – and hence productivity – of Africa's land resources is declining, while the number of poor people and land-derived goods and services are increasing dramatically.

About 874 million hectares of Africa's land is considered suitable for agricultural production. Of this, about 83 percent have serious soil fertility or other limitations and will need costly improvements and amendments to achieve high and sustained productivity.

Land degradation is continuing and increasing in severity and impact. If present trends continue, two-thirds of Africa's croplands could effectively be non-productive by 2025 (UN, 2004). At the same time the total area and productivity of Africa's traditional rangelands is decreasing. The ecological, economic and social consequences of this will be severe for not only the welfare of individual rural households, but also for future development and social stability, both urban and rural, at the country and regional levels. If nothing is done to address the problem, the future for Africa will surely be bleak.

Economic consequences Globally, an average of only 4.4 percent of GDP comes from agriculture. However in Africa that percentage is nearly 30. This means that continued land degradation is a major factor to Africa's under-development. As land productivity has declined, the useful, or economic, yield from individual croplands, rangelands and forests/woodlands has also declined. Soil nutrient depletion in the fields of Africa's small-scale farmers is severe with inadequate replenishment of the nutrients lost due to soil erosion, leaching and removal in harvested products. Given the higher potential of irrigated areas, the economic losses due to land degradation per unit area will be significantly higher than in the continent's rain-fed farming areas. Rangeland degradation involves both reduced forage productivity and quality, water cycling effectiveness and resilience for drought. In years with unfavourable rainfall, this has often led to major livestock losses.

Table 3: Some Economic Consequences of Land Degradation in Sub-Saharan Africa

Economic Consequences	
Consequence	**Nature and Severity of the Economic Losses**
Loss of GDP	• Over 3 percent of Africa's agricultural GDP lost annually as a direct result of soil and nutrient loss – equivalent in cash terms to US$ 9 billion per year (Dregne, 1991, Dreschel et al., 2001).
Crop Yield Losses	• In originally fertile lands, under continuous cropping without nutrient inputs, cereal grain yields declined from 2-4 tonnes per hectare to under 1 tonne per hectare (Sanchez et. al., 1997). • In 1989, it was estimated that crop yield losses due to past erosion ranged from 2 to 40 percent, with a mean of 6.2 percent for Africa. In the absence of erosion, 3.6 million tonnes more of cereals, 6.5 million tonnes more of roots and tubers and 0.4 million tonnes more of pulses could have been produced (Lal, 1995). • A study of the effects of soil erosion in Malawi (World Bank, 1992) found annual yield losses for specific crops varied from 4 to 11 percent, while a large field survey in Tanzania found yields were 30 percent higher in the areas with least erosion compared to those with the most (Kilasara et al., 1995).
Loss of Land Productivity	• The productivity loss in Africa from soil degradation since World War II has been estimated at 25 percent for cropland and 8-14 percent for cropland and pasture together (Odelmann, 1998). • Irreversible soil productivity losses of at least 20 percent due to erosion are reported to have occurred over the last century in large parts of Ethiopia, Ghana, Kenya, Lesotho, Nigeria, Southern Africa, Swaziland and Uganda (Dregne, 1990).

Soil Nutrient Loss	• Soil fertility degradation is considered the single most important food security constraint in Africa (Verchot, et al., 2007). • For the last 30 years, estimated average annual losses per hectare in 37 African countries are 22 kg of N, 2.5 kg of P and 15 kg of K (Sanchez, 2002). Replacing these lost nutrients by purchasing mineral fertilisers would cost about US $4 billion. • Reported average annual soil nutrient losses of 23 kg per hectare from 1983-1990 increased to 48 kg per hectare in 2000 (FAO, 2006). • There is a negative nutrient balance in Africa's croplands with at least 4 million tonnes of nutrients removed in harvested products compared to the 1 million tonnes returned in the form of manure and fertiliser (FAO, 2006).
Loss of High Value Irrigated Land Through Poor Irrigation Practices	• Many countries have lost a high percentage of their irrigated lands due to salinization Kenya (30 percent), Namibia (17 percent), Nigeria (34 percent), Sudan (27 percent) and Tanzania (27 percent). • In other countries, the losses of irrigated lands are due to water-logging DR Congo (20 percent), Mauritania (50 percent) and Gambia (10 percent)
Increased Food Imports and High Dependence on Food Aid	• Africa spent US$18.7 billion on food imports in 2000 alone. • The World Food Programme has spent US$12.5 billion (45 percent of its total investment since its establishment) in Africa and 50 percent in 2001. • In 2000, Africa received 2.8 million tonnes of food aid – over a quarter of the world total (CAADP, 2002).
Reduced Agricultural Exports	• Of the total merchandise exports from Africa, the contribution from the agriculture sector has declined to 20 percent from over 50 percent in the 1960s (CAADP, 2002).

Ecological consequences: The extreme ecological consequence has been the physical loss of formerly productive land, thereby reducing the area available for crop, livestock and forest production. The degradation of other ecosystem resources notably forests, water and biodiversity has also had severe ecological consequences.

Table 4: Some Ecological Consequences of Land Degradation in Sub-Saharan Africa

Ecological Consequences	
Consequence	**Nature and Severity**
Loss of Productive Land Resources	• Between 4 and 7 percent of Africa's land area is already so severely degraded that it is believed to be largely non-reclaimable (data from GLASOD and TERRASTAT). • This is the highest proportion of any region in the world.
Loss of Forest Resources	• 3.7 million hectares (0.7 percent of the total land area) lost to deforestation per year. • Between 1980 and 1995, Africa lost some 66 million hectares of forest, with 65 percent going in the 1990s due to rising demand for farm land, timber and other forest products.
Loss of Water Resources (Quantity and Quality)	• Some 86 percent of African soils are under soil moisture stress (Eswaran et al., 1997 found in Swift and Shepherd, 2007). • Degradation of the region's watersheds and river basins has led to river flows fluctuating more than before, with flooding more frequent and extensive in the rainy season, while water shortages are experienced for longer periods in the dry season. • Increased downstream sedimentation due to higher river sediment loads. • Increased surface runoff has decreased groundwater recharge – water tables have dropped, many former perennial rivers, streams and springs have been reduced to an intermittent flow and many wells and boreholes have dried up. • Lake Chad has shrunk in size due to degradation of its catchment area, combined with over extraction of water from its tributaries for irrigation, etc.
Loss of Biodiversity Resources	• Some 126 African animal species have become extinct[36] and a further 2,018 are threatened. • Some 125 plant species are recorded as extinct and close to 2,000 more are threatened, of which some 250 are critically endangered (APEI 2003, IUCN 2006). • Loss of such species means a loss of part of the world's global heritage as well as the loss of potential economic opportunities both now and in the future.

Social consequences There is a strong causal link between the incidence of land degradation and the incidence of rural poverty, with the poorest rural communities in Africa generally located in the most ecologically fragile and degraded areas. As the land becomes more degraded, it produces less, thus reducing the ability of poor households to meet their basic welfare needs. Poverty and land degradation feed off each other leading to an ever growing downward spiral. This in turn increases the demands on state and local government welfare services for food aid and other forms of poverty relief.

The economic losses from land degradation at the district and national levels likewise constrain the development of services in rural areas and the availability of off-farm employment, further enhancing the reliance of resource poor rural households on the exploitation of their local land resources.

[36] Or extinct in the wild as some species may still survive in zoos.

Table 5: Some Social Consequences of Land Degradation in Sub-Saharan Africa

Social Consequences	
Consequence	**Nature and Severity**
Increased Poverty	• In 2001, 45 percent of Africa's population lived below the poverty line of less than $1 per day. • If nothing changes, absolute numbers of poor will continue to increase, so by 2015 close to half the world's poor will live in Africa.
Reduced Food Security	• In the decade of 1990-2000, cereal availability per capita in Africa decreased from 136 to 118 kg per year.
Hunger and Malnutrition	• In 1997-99, some 194 million people (up from 167.7 in 1990-92) or 34 percent of the African population had insufficient food to lead healthy and productive lives. • At the end of the 1990's, more than 20 percent of the population in 30 African countries were undernourished. In 18 countries more than 35 percent were chronically hungry. • In 2001, 28 million people in Africa faced food emergencies due to droughts, floods and strife, with 25 million needing emergency food and agricultural assistance. • In Sub-Saharan Africa, 15 percent of the population or 183 million people will still be undernourished by 2030 – by far the highest total for any region, and only 11 million less than in 1997-99 (CAADP 2002). • Malnutrition is expected to increase by an average of 32 percent (UNDP 2006).
Increased Health Problems	• Hunger and malnutrition in Africa have increased susceptibility to malaria, HIV-AIDS and tuberculosis (CAADP 2002, Sanchez 2002). • Degradation of water resources has increased the risk of water borne diseases.
Forced Migration	• Land degradation has led to forced migration of individuals, rural households and communities, when declining productivity meant their land resources could no longer provide for their needs, or when their personal security was threatened (e.g. by encroaching sand dunes, floods or land-slides).
Increased Land Resource Conflicts	• Conflicts (between settled farmers, herders and forest dwellers) over access to land resources have increased as households and communities affected by land degradation have encroached on the traditional lands of others in the search for new land for their crops and/or livestock.

Through its impact on crop yields, livestock productivity, availability of forest products and indirectly on fisheries, land degradation reduces the ability of individual rural households to be food secure. Malnutrition due to poverty and declining food production and quality, combined with increased water borne diseases due to declining water quality, will result in increased health problems with their associated costs at both the individual household and wider society levels.

Given the extreme reliance of rural livelihoods on agriculture, forestry and livestock, it is reasonable to conclude that persistent and deepening poverty in Africa is in part an outcome of stagnation in the productivity of land and labour, itself a consequence of land degradation and unsustainable agricultural practices.

Annex 2: Agricultural Water Projects and Poverty Reduction

Direct and indirect impacts on income poverty reduction

Investment in agricultural water management can reduce income poverty directly and indirectly. The first direct effect is on farm incomes. Agricultural water management can increase yields, allow for an increase in the intensity of cropping and a change to higher value crops, and thus increase farm outputs and incomes. Farm outputs and incomes can also be increased because irrigation itself justifies the use of complementary yield enhancing inputs. For example, the component study on agricultural water development for poverty reduction in Eastern and Southern Africa (IFAD, 2007) reviewed five irrigation development programmes in Madagascar, Tanzania and Zimbabwe. Average increases in per capita farm incomes on rice projects in Madagascar and Tanzania were found to be in the range of 86 to 220 percent, while incomes on non-rice projects in Zimbabwe increased between 14 to 600 percent. The average increase in per capita farm incomes across the sets of case study projects was 226 percent. Investment in irrigation, in these cases, more-than tripled average per capita incomes. Moreover, none of the projects studied were achieving anywhere near optimum yields and outputs. For example, the weighted average paddy yields at one project studied (Upper Mandrare Basin Project, Madagascar) were well below potential at 1.9 tonnes per hectare and 1.3 tonnes per hectare respectively for the main and off-season crop. Similarly, average irrigated grain maize yields at three non-rice projects in Zimbabwe were only 2.5 to 3.4 tonnes per hectare. The lesson is clear: even moderately performing investment in irrigation can have significant impacts on farm incomes and hence on poverty reduction. The corollary is that such projects could have a far greater impact on poverty reduction if they performed better.

The second direct effect of agricultural water management on income poverty is via rural employment. Additional demand for labour is created first for construction and on-going maintenance of canals, wells, pumps and the like (or land preparation in the case of investments in in-field rainwater management) as well as for crop production and farm-to-market activities. Thus, agricultural water development increases both the numbers of workers required and (because of multiple cropping) their period of employment (Lipton et al., 2003). In the projects analysed by the study, investment in irrigation was found to have resulted in an incremental 45 days/ha of wage labour on average, over and above farm family labour, valued at approximately $1/labour-day (IFAD, 2007).

The third direct effect is via food prices. Increased food outputs can reduce local food prices and thus improve real net incomes among food purchasers. At the same time, positive effects on real net incomes will still be experienced by food producers and wage labourers provided the effect of reduced prices is offset by increased output and employment. On the other hand, negative effects may be experienced by surplus producers in remote dry-land cropping areas when agricultural water development is introduced. However, because the majority of the poor in Sub-Saharan Africa are net food purchasers, the overall effect of reduced food prices on income poverty reduction and hunger can be expected to be positive (Lipton et al., 2003).

The indirect impacts of agricultural water development on income poverty can include those obtained via rural and urban employment as a result of growth in the rural and urban non-farm economy. Agricultural growth can influence non-farm activity in at least three ways: through production, consumption and labour demand links (Rosegrant et al., 2005). Income and employment multipliers within the surrounding non-farm economy can be particularly large: between 1.5 and 2.0 in Asia (Haggblade et al., 1989 and Hazell et al., 1991; both cited in Rosegrant et al., 2005), although they are only about one-half as large in Africa (Dorosh et al., 2000 and Haggblade et al., 1989; both cited in Rosegrant et al., 2005). Lower multipliers in Africa were attributed (Dorosh et al.) to low per capita incomes, poor infrastructure and farming technologies that required few purchased inputs — in other words, to a less developed agriculture sector. Water-managed agriculture intrinsically involves higher levels of inputs — including labour — and results in greater employment, outputs and incomes than dry-land agriculture. Thus, the multipliers from successful agricultural water investment are likely to be higher than those for investment in dry-land agriculture in general. Although no information was available on the non-farm employment impacts of agricultural water development in Sub-Saharan Africa, non-farm employment in India has been found to be higher in irrigated villages than in non-irrigated villages (Dasgupta et al., 1997; Jayaraj, 1992; Saleth, 1996, all cited in Rosegrant et al.,

2005). Likewise, at the large-scale Muda Irrigation Project in Malaysia, for every dollar of income generated directly by the project, another 83 cents was generated in the form of indirect or downstream income benefits (Bell et al., 1982, cited in Rosegrant et al., 2005). *To sum up, even moderately successful investment in agricultural water development can treble per capita farm incomes and provide additional wage employment of approximately 45 labour-days/ha, which in itself has a significant impact on income poverty reduction.* Every dollar of income so generated likely generates at least US$ 0.40-0.50 in the form of indirect income benefits. This is so even for investment projects that perform only modestly.

Agricultural water development could also be one of the better alternatives for poverty reduction. Clearly, investment in agricultural water development can have substantial impacts on income poverty reduction. But is it the best of the available alternatives? As discussed, when up to 90 percent of rural people are poor and rely on agriculture for their primary livelihoods, significant growth in agriculture is a necessary step toward poverty reduction. Although improved primary education, better health services, clean water and better roads are all important and appropriate investments, they are not sufficient by themselves to generate increased rural incomes (Brooks, 2005). Since agricultural growth is so important for poverty reduction, agricultural water development could be even more so, since the potential income growth per hectare from successful investment in agricultural water is greater than that from dry-land agriculture. Although data is not available to prove the validity of this assumption for Sub-Saharan Africa, differences in the rate of growth of average agricultural output per unit of crop area were important in explaining cross-state differences in rural poverty reduction in India, for example, where the impact of irrigation in reducing poverty was found to be even higher than that of rural literacy and significantly higher than roads, fertilizers and modern varieties (Datt et al., 1997, cited in Rosegrant et al., 2005). If this is the case elsewhere, there would appear to be no reason why the same should not apply in Sub-Saharan Africa.

Furthermore, the income poverty reduction impacts of agricultural water investment can induce positive impacts on other MDGs. The income poverty reduction impacts of agricultural water investment induce important positive impacts on other MDGs, including reduced hunger, improved access to primary education, safe drinking water and basic sanitation, as well as a contribution to improved maternal health, reduced child mortality and generally better nutrition and health (IFAD, 2007).

Targeting the poor and women

Some irrigation project designs of the past two decades have attempted —usually unsuccessfully — to target the poorest. Defining extreme poverty in terms of the MDG income poverty level has now simplified targeting. Where targeting the poorest socio-economic stratum has been specified in the past, it has rarely been implemented as planned (IFAD, 2007). Either the technology was inappropriate for the poorest and the targeting methodology was weak or implementation staff had not fully understood the intentions, or found it socially infeasible to carry out because of the socio-geographical and political implications of excluding the less poor. Defining extreme poverty in terms of per capita income of less than $1/day has simplified targeting, as most rural people in the region have to subsist on less than this amount. For example, in the Madagascar, Tanzania and Zimbabwe cases cited above, no attempt was made at targeting, yet it is clear that it was mainly the extreme poor who benefited because average without-project farm incomes ranged from only $0.03 to $0.13/day.

Agricultural water investments, even without targeting, will therefore mainly benefit the extreme poor, although in a range of different ways. It is likely that the vast majority of the rural populations of Sub-Saharan Africa fall into the category of ‘extreme poor’ and almost any agricultural water development based on principles of profitability and equity will benefit a majority of poor people. However, different poor people may benefit in different ways: (i) from direct participation as producers; (ii) directly from agricultural wage employment; (iii) from access to crop by products for livestock; and (iv) from employment in upstream and downstream economic activities generated by the investment. Moreover, it is usually the poorest stratum that benefits most from the additional wage employment opportunities generated by investment in agricultural water (IFAD, 2007).

There are numerous ways in which the poverty reduction impacts of investments can be enhanced. The first step is to understand the socio-economic profile of the communities, how they derive their

livelihoods, what their constraints are, how they interact socio-economically and how agricultural water management can improve their livelihoods. Based on this knowledge, measures can be included to make projects more pro-poor. These measures can include: (i) capacity building and empowering the poor to participate effectively; (ii) ensuring that the voice of the poorer segments of communities is adequately heard in participatory planning and land and water allocation decisions; (iii) minimising involuntary resettlement and ensuring that the poor are not excluded or further marginalised by development; (iv) strengthening the bargaining powers of the poor though institutional reform and facilitating their access to land and water; (v) targeting the poor with extra technical support; (vi) ensuring that the entry price is affordable to the poorest stratum, for example, by the use of affordable technologies; (vii) ensuring that cost-recovery arrangements/water charges are not unfairly weighted against the poorest stratum; and (viii) optimising the potential for direct and indirect employment gains.

Targeting agro-ecological zones and farming systems with high agricultural potential and concentrations of poverty can also be pro-poor. When arid and semi-arid zones were targeted for poverty reduction, the results were mixed, mainly because of the generally high costs of water development in such zones, their remoteness from markets and sparse populations (IFAD, 2007). In contrast, the more humid agro-ecological zones, which also coincide with high incidences of poverty, provide better potential for investing in agricultural water for poverty reduction (Dixon et al., 2003). This perhaps surprising suggestion may be explained by considering that, as population densities increase, farmers gradually shift from extensive to increasingly intensive production systems. The trend is encouraged once significant market opportunities emerge. Where population densities are high, a process of intensification has already started and market opportunities are emerging, investment in agricultural water development is likely to be more successful than in drier zones. This does not exclude the possibility that there will be opportunities for investment in agricultural water management in the arid and semi-arid zones and that these could make a significant contribution to poverty reduction and growth — provided they are demonstrably economically viable and physically sustainable.

In addition to considerations of gender equity, targeting women can also enhance poverty reduction impacts. Women contribute 60-80 percent of labour for food production in Sub-Saharan Africa, typically with a major role in planting, weeding, application of fertilizers and pesticides, harvesting, threshing, food processing, transporting and marketing, while men are generally responsible for land clearing and preparation, including ploughing (FAO, 2003a). This division of labour also applies in irrigated agriculture. In many Southern African countries, the proportion of female-headed rural households and women-led farms exceeds 50 percent (IWMI, 2005g). At selected schemes in Zimbabwe, for example, 20-64 percent of the plot holders were female-headed households (IFAD, 2007). In rice-growing areas in West Africa and parts of Southern and Eastern Africa, paddy cultivation is increasingly becoming a 'female farming system' in which women are often the decision makers on formerly male managed farms as a consequence of male migration to towns for work (IWMI, 2005g).

Women often take the lead in fruit and vegetable production (Box 3.4) as well as in production support activities such as savings groups (IFAD, 2002). Studies have shown that gender-equitable agricultural production boosts productivity (IWMI, 2005g). Clearly, then, targeting women for training and support services and ensuring their equitable participation in the benefits of agricultural water investments can improve productivity and enhance poverty reduction. Yet most staff in support services is male and policies and communications strategies are biased toward males. Projects can compensate for these biases by building gender considerations into design and implementation from the outset (IWMI, 2005g).

Annex 3: Investment Performance and Development Impact in Agricultural Water Development

Rates of return: Although there were many failures in the 1970s and 1980s, recent irrigation projects have generally had acceptable rates of return. A component study for the collaborative programme study report (IWMI, 2005b) reviewed 45 donor-financed projects implemented in Africa from 1970 onwards. The study found that externally financed projects up to 1984 had often dismal outcomes: investment was largely in development of new large-scale irrigation, with very high costs per hectare and low or negative rates of return. After 1985, outcomes improved: of the 22 Sub-Saharan Africa projects reviewed that began in 1985 and later, only one had an ERR below 10 percent and others had ERRs ranging up to 60 percent and above. The key factors associated with higher rates of return include lower per hectare costs, market access, productivity and institutional design. A number of factors influence rates of return. The study found that Sub-Saharan Africa projects with higher per hectare costs tended to have lower ERRs, while weaker projects (those with ERRs below 10 percent) had, on average, unit costs per hectare four times those of successful projects (ERRs above 10 percent). The component study found that lower-cost improvement projects have higher ERRs than new construction projects (IWMI, 2005b), a finding that is confirmed by the Zimbabwe experience where upgrading cost 20 percent of new gravity development and 40 percent of new pumped supply and where upgrading projects had much higher rates of return (IFAD, 1999, cited in World Bank, 2005c). Second, market access matters: projects where higher-value crops can be sold profitably do better. In Zimbabwe, projects with good market access have rates of return generally at least three times higher than where market access is poor (IFAD, 1999, cited in World Bank, 2005c). Third, productivity makes a difference. In Malawi, 28 small-scale schemes were ranked according to the use of production factors and all the low input-low output schemes had significantly lower ERRs, while five had negative ERRs (Malawi Small- Scale Irrigation Development Project). Finally, attention to institutional and software aspects of projects is important, especially empowerment of farmers and streamlining of the role of public agencies. Systems managed by farmers or jointly with government have performed significantly better than systems managed solely by a government agency (IWMI, 2005b).

Sustainability: Returns to investments in irrigation can be high, but the risks are also high, and irrigation projects have a mixed track record on sustainability. Despite the findings of the component study that rates of return for completed projects have largely improved, the record on sustainability has been mixed. The frequent need for rehabilitation projects in large-scale irrigation in Sub-Saharan Africa (Sudan, Madagascar, Mali) is testament to the poor sustainability of some supposedly 50-year investments in the sector. Rates of return calculated for externally financed projects at completion of the construction phase have sometimes had to be revised downward subsequently and current reports of the performance of projects previously rated as successful are not always encouraging.

Are irrigation investment costs higher than elsewhere? *Past studies found the cost of irrigation development in the region to be excessively high.* A 1995 study found that World Bank-financed irrigation projects in Sub-Saharan Africa cost an average $18,000 per hectare, compared to an average worldwide of $4,800 per hectare (World Bank, 1995). These findings reflected the very high cost of the generation of large-scale schemes constructed in the region during the 1970s and 1980s — the nine major donor financed projects in the period 1975-79 had an average cost per hectare of $24,500. Not surprisingly, governments and financiers tended to view irrigation investments as high cost and uneconomical, particularly large-scale investments that carried greater environmental and social risk. Investment behaviour has been risk averse in recent years and investment in irrigation has dropped. The component study on irrigation investment costs (IWMI, 2005b) found that the new generation of irrigation projects in Sub-Saharan Africa is not much more costly than those in other regions. Irrigation projects that could be called successful because their rate of return at completion was more than 10 percent did not have significantly higher costs than those of developing countries as a whole. For new construction, Sub-Saharan Africa successful projects cost somewhat more than successful projects in Asia, but less than those of the highest cost region, the Middle East and North Africa. The cost of failed projects in Sub-Saharan Africa was significantly higher than for developing countries as a whole: it averaged $16,000-23,000 per hectare. However, as noted above, project performance appears to have improved in recent years — only one post-1990 project appears among the failures in the sample.

Main factors affecting costs: *The biggest determinant of project costs is the type of irrigation investment financed.* The range of costs in the sample for the component study is huge — from $225 per hectare for simple rehabilitation to $55,000 per hectare for a large-scale multi-purpose project. The principal reason for the lower unit costs of projects recently is the move away from the construction of large-scale schemes to rehabilitation projects and, more recently, to small-scale and micro-irrigation projects. Evidently, the lessons of the past have, to some extent, been learnt. This change is also linked to the continuing decline in cereals prices and hence to the deteriorating economics of large-scale irrigation for staples as well as to the improving economics of horticulture, for which smaller scale and micro-irrigation is well adapted (IWMI, 2005b). *The evidence on economies of scale is mixed.* The component study found that unit costs vary inversely with project size, i.e., there are economies of scale, but that within larger projects smaller scale schemes had higher economic returns (IWMI, 2005b). By contrast, an FAO study (FAO, 2005b) found only weak correlation between project size and unit costs. Although the sample sizes in the studies are too small and the population too heterogeneous to establish clear conclusions, it is likely that the region's high software costs do reduce when apportioned over larger projects. *Community empowerment may keep costs down and improve performance*. The component study found that projects where farmers themselves made larger capital contributions and managed irrigation systems or shared management with a government irrigation agency recorded significantly better results in terms of project performance and unit costs (IWMI, 2005b). *To some extent, the lessons on keeping costs down are already being reflected in recent projects.* More recent projects are selective in choice of technology and are often decentralized and farmer-driven, with higher farmer contributions and leading to lower unit costs. For example, for new development at Mali's Office du Niger, farmers were asked to contribute 20 percent of the total cost. As a result, development costs, which have typically exceeded $10,000 per hectare for large scale development, were only $2,518 per hectare (Aw and Diemer, 2005).

Experience of design and implementation: The component study on the design and implementation processes (IWMI, 2005d) found that project design in the past was largely top down, although newer projects are adopting more participatory approaches. Although there was a wide divergence of experience, the study found that past project design was generally characterised by a lack of fit of projects to goals, lack of consideration of alternatives and lack of demand drive. Schemes developed by governments were often based on imperfect understanding of markets, farming systems and livelihood strategies. The component study found that newer projects have adopted a less top-down approach. In some countries, a start has been made on integrating user participation (intellectual and financial) into project planning and implementation. Some of these projects are carried out through decentralised units as part of larger community driven rural development programmes. In fact, many of the donor-financed projects that have been evaluated as successful on completion in recent years have been characterised by both decentralised and participatory approaches. It is, however, too early to tell whether these approaches consistently improve project performance and if decentralisation has encountered problems. *The quality of projects has been reduced by common weaknesses in preparation.* Weaknesses include: (i) poor treatment of the key land and water security issues; (ii) lack of adequate environmental assessment; (iii) lack of evaluation of markets and profitability; (iv) lack of a related realistic agricultural support package; (v) over-estimation of institutional capacity, evidenced by too complex designs and too many components; and (vi) poor technical design and over-optimistic hydrological analysis (IFAD, 2007). Weakness has resulted in technology choices and costs that were not appropriate for the market prospects of the crops grown (IWMI, 2005d).

Farmer empowerment appears to improve project quality. Underlying these weaknesses, the study found a pervasive top-down approach and neglect of farmer ownership. By contrast, approaches that empower farmers by taking them in as partners and decision makers from the beginning and supporting their development as commercial agents equipped to deal in the market place appear to have the potential to improve the economics and prospects for project sustainability. Approaches to empowerment found to significantly improve project quality at entry include: (i) moving responsibility and capacity for project implementation and services to the local level; (ii) increasing the participation of disadvantaged groups in decision making; (iii) improving the accountability of service providers; and (iv) helping smallholders form strong organisations (IWMI, 2005d; World Bank, 2005m).

Weaknesses in institutional capacity have impaired project implementation. The study found that implementing agencies have often proved inadequate to the tasks they were given. In many cases, weaknesses reflect the complexity of the organisational structures set up and the performance of the staff involved. Public agencies have often lacked the skills, resources and incentives to do the job assigned to them, while the comparative advantage of the private sector or NGOs for certain tasks has been generally ignored. Project agencies also had difficulty in coping with design changes as implementation proceeded. A particularly difficult challenge has been dealing with the social and cultural problems encountered where institutional changes such as irrigation management transfer or private sector participation were part of project implementation (IWMI, 2005d; FAO, 2006).

Inadequate support to the implementing agencies has also been a cause of poor quality. In general, the component study found that governments and donors have provided a supervision process that did not match the challenge of implementation under conditions in the region and that this support stopped too early in the cycle. There has been overemphasis on reaching physical and disbursement targets at the expense of development effectiveness (IWMI, 2005d; IFAD, 2007). Even where promising new approaches such as decentralisation and participation were incorporated into projects, success was not automatic: problems of technical, financial and social feasibility have constantly arisen during implementation. The managers of even well implemented projects have sometimes lost sight of the poverty reduction and cost effectiveness imperatives. In general, governments and donors have not reacted with a supportive and flexible approach to help managers trying to implement projects. Weaknesses in the learning process have made it hard to assess project impacts and to rectify shortcomings. Monitoring and evaluation have generally been poorly handled, with design only loosely tied to the Log Frame, which should form the basis for the monitoring and evaluation system. Implementation of M&E systems has typically started far too late in the cycle and there has been an almost complete failure to recognize that: (a) information systems are not only a fundamental requirement for project-level M&E but also for farmers' enterprise management purposes; and (b) that farm-level information systems are required to feed into project level M&E systems. Thus, although many projects have poverty reduction objectives, almost none have monitored indicators of income such as input levels, yields, production and prices (IWMI, 2005d). In a study of six projects in the region, none systematically measured yields, prices or farmer incomes. As a result, it is not possible for farmers to accurately judge the effectiveness of improved technologies nor is it possible for the projects to provide adequate ex post justification for the investments made. Moreover, the lack of monitoring applies equally to environmental and health aspects, despite their obvious relevance to sustainability (IFAD, 2007). Poor sustainability in subsequent operations reflects weaknesses in design and implementation. The component study found that weakness in scheme operations after completion of the physical works largely stemmed from weaknesses earlier in the project cycle: an over-estimate of water resource availability, poor design and construction, inadequate attention to institutional arrangements and agricultural support services, and above all, general neglect of farmer empowerment and underlying conditions of profitability. The most telling indictment is that in many cases farmers have refused to take over responsibility for operation and maintenance of schemes supposedly developed for their interests (IWMI, 2005d; FAO, 2006).

Box 13: Taking account of livestock in agricultural water investments

Crops and livestock are closely linked components of irrigated production systems and can be potentially fast growing and profitable enterprises where rapid urban growth generates demand. Growth in associated irrigated crop and livestock production is most likely in countries and areas with large animal populations and good access to markets.

To exploit possible complementarities between agricultural water development and livestock production, planners should work with stakeholders to assess ex ante the likely impact of irrigation development and correlated changes in land use on livestock keepers.

Taking account of livestock in this way will minimise costs to livestock keepers of lost access to land and water resources and passageways as well as mitigate any social tension or risk of impoverishment. In most cases it will also allow complementary investment and management that can improve livestock productivity — access to watering points, land and paths zoned for livestock and encourage the adoption of cropping patterns that have significant quality residue for use as animal feed or the development of zero-grazing systems based on irrigated crops and residues. Beyond the irrigation scheme itself, it may be possible to integrate management of upland catchment areas with downstream agricultural water service, which may involve investments and management to ensure that upstream pastoral systems remain profitable while conserving soil and water resources.

Source: IWMI-ILRI, 2005e

Annex 4: The National Level CAADP Pillar 1 and Operationalization Road Map

At the national level, successful operationalization of CAADP Pillar 1 Framework will involve a series of steps, each with its own set of activities to be undertaken at the national, district and/or local levels, including:

Step 1: Building national commitments and partnerships

- ***Building a broad based national coalition*** – by: (i) identifying the concerned SLWM stakeholder institutions (within central and local government, the private sector, civil society and international partner agencies); (ii) selecting key stakeholders to act as the principal champions for driving the SLWM agenda and planning process at country level; (iii) building on existing delivery mechanisms such as sector programmes in agriculture, environment or land and strengthening their land management components; (iv) using a pre-existing land/agriculture/environment fora or establishing a core country SLM and water strategies team, made up of designated senior representatives from the main stakeholders, to assume lead responsibility for the national programme; and (v) setting up a broad consultative forum with a wider membership representative of all the concerned stakeholders. The aim is to bring together national, district and local/community level stakeholders in a multi-level partnership able to advocate a common vision of SLWM, share analyses, set the foundations for strengthening and harmonizing policy dialogues and strategies and improve coordination at all levels.

- ***Sensitisation and advocacy*** – in order to raise awareness and build a national consensus amongst all stakeholders on: (i) the concepts and principles of SLWM as they relate to the local, district and national level environmental and socio-economic circumstances of the country; and (ii) the need to mainstream and scale up SLWM within a comprehensive national programme aimed at addressing land degradation, food insecurity and rural poverty. A key task for the country SLWM team at this stage will be to build the necessary political commitment and secure the increased public funding required to address the barriers and bottlenecks to SLM and water strategies.

- ***Agreement to a common code of conduct*** – to be followed by the concerned stakeholders in the operationalization of CAADP Pillar 1 Framework at the national level. This is to include agreement to: (i) build a common diagnosis and shared vision for SLWM within the country; (ii) share information about past, on-going and planned SLWM interventions; (iii) better coordinate and harmonise existing SLWM interventions and investments; and (iv) align future SLWM projects and programmes under the umbrella of a Country Strategic Investment Framework (CSIF).

Step 2: Stocktaking, analysis and diagnosis of the in-country situation

Step 2 will involve a stocktaking exercise to analyse and diagnose the constraints, barriers and bottlenecks for mainstreaming SLWM within central and local government development policies and programmes and to identify the opportunities and scope for scaling up successful technologies and approaches. This step will involve five interrelated sets of component activities:

- ***Documentation and assessment of SLWM technical interventions*** and water strategies– identify and agree upon what can be considered past/on-going SLWM strategies interventions in the country in order to carry out a review of past interventions, to identify factors of success/failure, best practices and lessons learnt. Determine the technical effectiveness and cost-efficiency of the various interventions used to date with the aim of identifying the 'best practices' for scaling up under the CSIF. Additional studies concerning the cost-effectiveness of interventions /techniques will need to be carried out in order to convince farmers/land users and policy makers alike of their relevance and importance. A diagnostic of land degradation, by interpretation of satellite imagery combined with sample soil surveys, should be a preliminary step to up-scaling SLWM strategies.

- ***Ecosystem assessment*** – so as to identify, characterise and map the country's ecosystem resources that are currently, and/or potentially could be, used to support sustainable crop, livestock, forestry and eco-tourism enterprises. This will involve determining the constraints and opportunities related to the biophysical properties and the socio-economic characteristics of the major land use systems pursued. Such information will be presented as a land use plan for the country, showing for each area the best combination of crops and land husbandry practices (including soil conservation practices) and will serve as the basis for identifying: (i) areas where SLWM strategy interventions are required to address problems of land degradation and low agricultural productivity and to sustain ecosystem health and services; (ii) areas suitable for scaling up specific 'best bet' SLWM technologies and approaches; and (iii) areas where particular land use enterprises could be pursued on a profitable and sustainable basis.

- ***Policy diagnosis*** – will involve reviewing the legal, regulatory and policy environment in which interventions will be undertaken to identify where there are barriers and bottlenecks that can be changed in order to create an enabling environment for the mainstreaming and scaling up of SLWM. Each country will require a clear policy direction in SLM and water strategies including priorities, goals and targets informed by research and a clear role distribution among agencies

- ***Institutional diagnosis*** – will involve an assessment of the legal mandates, technical duties and areas of responsibility of the various national and local level institutions directly, or indirectly, involved in SLWM related activities[37]. This review will also assess the capacity of the institutions to provide the necessary support services to the land users (e.g. skilled manpower, equipment, buildings) as well as documenting the range of related activities each institution undertakes and highlight the possible overlaps/gaps between agencies.

- ***Financial diagnosis*** – will involve a review of the financing modalities and delivery mechanisms in place, including their strength and weaknesses, which could be used to channel increased funding for SLWM strategies. This will involve documenting the: (i) source of such investments (central and/or local government, donor agencies, private sector companies, NGOs, communities and rural households); (ii) type of investment (annual budget allocation, grants, loans, in-kind); (iii) amount invested; and (iv) actual, as opposed to proposed, expenditure on SLWM.

By the end of this step, the various assessments and diagnosis should be synthesised in a short strategic note laying out some priority investment areas that will likely have the greatest impact on reversing land degradation. A long list of recommendations of where there is a need and scope for change to promote SLWM will be compiled. This list will serve as the basis for the next step involving the formulation of the CSIF and County Agricultural Water Development Strategy.

Step 3a: Formulation of the Country Strategic Investment Framework

This step involves three sets of component activities:

- ***Identification and priority setting*** – which will involve a consultative process of screening the options for change identified in Step 2 and prioritising them according to whether they: (i) are technically sound and financially viable; (ii) fit national and local priorities; (iii) have the necessary support services in place (or could be relatively easily developed); (iv) have a local champion; (v) are synergistic with other investments; (vi) represent new development opportunities; (vii) offer win-win scenarios (addressing both production and conservation objectives); and (viii) provide opportunities for rapid mainstreaming and up-scaling.

- ***Preparation of a preliminary CSIF outline*** – providing details of possible investment/actions, including capacity building requirements, to be included in the full CSIF. The outline is to consider four broad components: (i) supporting on-the-ground activities (catalytic investments for scaling-up SLWM interventions); (ii) creating a conducive environment for mainstreaming SLWM in development policies and programmes; (iii)

[37] Specifically those stakeholder institutions identified during Step 1.

strengthening government and private sector advisory support services for SLWM; and (iv) developing effective SLWM monitoring and knowledge management systems (see Table 5 for elements within components).

- ***Formulation and costing of the full CSIF*** – will involve the detailed design and costing of the proposed component activities. This to be done in participation with the beneficiaries. This part of Step 3 will also involve assessing and mobilising the required financing as well as identifying stakeholder partnerships and capacity building needs.

Table 5: **Mainstreaming and Up-Scaling Components and Main Types of Activities**

1. Supporting on-the-ground activities for scaling up SLWM	**2. Creating a conducive enabling environment for SLWM**
1.1 Providing capacity building for SLWM implementers (farmers, forest users, rural community members, etc.) to support integrated approaches to natural resources management. 1.2 Providing technical and financial support for the implementation of participative planning and management of both collective and private SLWM investments at landscape level. 1.3 Organising and funding SLWM investment pilots/demonstration sites with embedded scale-up strategy such as farmers field schools, etc. 1.4 Strengthening farmer/producer organisations for adoption and up-scaling of SLWM practices with technical, financial and political support so that they are part of the decision making process (country team, SLWM fora). 1.5 Providing incentives for SLWM adoption, including support to design of environmental services payments, targeted matching grants or credit programmes.	2.1 Integrating SLWM into national and sectoral development frameworks at national and decentralised levels. 2.2 Encouraging land markets regulated by a land policy, where land users are involved in its monitoring and where land rights and customary tenure are recognised and protected at private and collective levels. 2.3 Encouraging land tenure that records and protects SLWM investments as land capital improvements (accordingly reflected in value of land). 2.4 Reviewing country investment programmes and public expenditure frameworks to identify constraints and entry points for SLWM and to increase predictability of financial flows to SLWM. 2.5 Identifying SLWM indicators and programmatic SLWM budget codes that will allow SLWM budgeted and executed figures to be tracked through public finance management tools and linked to associated results. 2.6 Identifying and protecting new food chain opportunities (organic, fair trade, eco tourism and bio-energy) so that land users get a better return on their SLWM investments. 2.7 Strengthening traditional and innovative conflict resolution mechanisms to prevent mitigate and resolve conflicts over natural resources. 2.8 Provide tax exemptions to purchase inputs that will be used for SLWM adoption/up-scaling.
3. Strengthening commercial and advisory services for SLWM	**4. Developing effective SLWM knowledge management, M&E and information dissemination systems**
3.1. Strengthening capacities of field operators to provide SLWM input and output services. 3.2. Creating and enforcing a SLWM derived product label, which will allow premium payments to land users. 3.3. Marketing support for outputs from SLWM, including certification systems to strengthen fair trade and eco-labelling schemes. 3.4. Advising providers of financial services to offer financial products to support SLWM adoption.	4.1 Exposing land users to SLWM knowledge and experience including best practices through targeted awareness/training campaigns including videos and radio programmes. 4.2 Supporting specific targeted and applied SLWM research (technical, economic, social). 4.2 Supporting knowledge sharing and innovation networks based upon participatory/community-driven and interactive approaches such as field visits and demonstration sites. 4.3. Strengthening capacity of SLWM stakeholders for innovation. 4.4 Developing SLWM monitoring and evaluation tools for CSIF implementation and evaluation (with selected indicators to be aggregated from local to national and regional levels). 4.5 Developing effective national dissemination strategies for lessons and best practices. 4.6 Developing an education curriculum that includes SLWM.

Step 3b: Formulation of national agricultural water development strategy

Based on the results of Step 2, each country should develop a national strategy for the agricultural water sub-sector that recognises its importance for agricultural growth and poverty reduction and the economic realities as well as the need for water to be developed within a broader framework that promotes agricultural growth through profitable investment and market-oriented production. The strategies should be supported by a comparative analysis of the various investment options, including: (i) investment in increasing productivity and profitability of existing schemes; (ii) expansion or new construction of large, medium, small and micro-scale irrigation schemes (including water harvesting) linked to profitable markets, following best practices for new storage and based on viable institutional models; (iii) testing and scaling-up of technologies for in-field rainwater management, provided these are proven to be technically and financially feasible and replicable by smallholder farmers on a sustainable basis; (iv) development of sustainable supply chains for micro-scale irrigation and in-field rainwater management equipment; and (v) investment in research on agricultural water management, both adaptive research at the national and regional levels and basic research at the regional level. Particular emphasis will be needed on several components: (i) the technology, profitability, affordability and replicability of in-field rainwater management for dry-land crops; (ii) crops and crop husbandry improvements for staples; (iii) monitoring and evaluation of the performance of agricultural water investments on a region-wide basis in order to provide the basis for rapid scaling-up of emerging successes; and (vi) investment in institutional reforms, including those for decentralised development and any necessary capacity building.

Box 14: Recent irrigation strategies are in line with a market-driven approach

Working with the FAO, six West African governments — Mali, Mauritania, Senegal, Ivory Coast, Niger and Burkina Faso – have developed irrigation strategies with common approaches. These include:

- A redefinition of the roles of the state, farmers and the private sector with an emphasis on liberalisation, farmer empowerment and minimal government involvement;
- Participatory approaches from identification of projects through to management of the works;
- Prioritisation of individual or small group schemes;
- Review of more alternative interventions to find solutions that are least costly to implement and most profitable for farmers;
- Accounting for environmental impacts and social equity;
- Requirements that farmers cover O&M costs and a share of the capital costs;
- Removal of administrative and fiscal obstacles; and
- Promotion of demand driven research.

Source: Gadelle in Sally et al., 2002

The strategy process involves the same sets of component activities as the CSIF formulation.

Step 4: Implementation of the Country Strategic Investment Framework and the AWD Strategy

The CSIF needs to be more than just an approved document. Rather, it needs to be made operational. Hence, step is concerned with ensuring the implementation arrangements with regard to financing modalities and delivery mechanisms being in place. This is to ensure the effective mobilisation and harmonisation of the CSIF SLM and water strategy proposals, with the focus on investments that are: (i) people-centred; (ii) integrated; (iii) built on existing knowledge; (iv) multi-scale and multi-level; (v) based on partnership and responsibility; (vi) aimed at removing bottlenecks; and (vii) coordinated and aligned for implementation within existing national mechanisms (e.g. national action programs to combat desertification and reduce poverty) and African regional level initiative, notably the NEPAD.

Toward this end, this step will focus on improving national level knowledge generation and management with the aim of cost effectively identifying, generating, organising and disseminating high-quality, customised knowledge that can be used to: (i) support decision-making; (ii) inform policymaking; (iii) advance mainstreaming (in particular in the national poverty reduction strategy, donor country strategies and sector plans); and (iv) help secure future domestic financing. It will involve a review of existing baseline data sets and institutional information systems with the aim of

identifying key gaps and improving the sharing and dissemination of SLM and water strategy information. A main component of this will be the documentation and dissemination of local level experience with successful SLWM technologies and approaches as part of a strategy for scaling up the geographic area impact of existing successes on the country's inter-related problems of land degradation, declining agricultural productivity and rural poverty.

Further, this step should focus strongly on building the multi-level capacity required to implement the CSIF proposals, in particular:

- ***National policy level*** – with emphasis on building the capacity of senior officials and policy makers to review and formulate policies that address productivity and ecosystem resource sustainability issues and to enable them to mainstream SLWM and integrated ecosystem management (including biodiversity, carbon sequestration, etc) into national programmes (poverty reduction, MDGs, etc) and to create the required enabling environment.
- ***Technical agency level*** – with the aim of strengthening institutional mechanisms and capacities for inter-sectoral approaches and promoting community-based participatory planning for the identification and adoption of locally appropriate SLWM practices.
- ***District/provincial level*** – with the emphasis on building decentralised planning and advisory support service teams that can promote the field level scaling up of successful SLM and water strategy practices by providing rural communities with the required technical advice, credit, investment, tools, etc.
- ***Local/community level*** – with the aim of building capacity of community-based organisations to test, develop and adopt improved locally adapted SLWM practices for individual farm plots, communal pastures and forest areas (e.g. using FFS approaches).

Table 6: Principal Forms of Land Tenure in Africa

Form of tenure	***Main features***	***Examples***	***Prevalence***
Freehold	Absolute title to land, including the rights of use, control and disposal, guaranteed and backed by the state. May be held by groups but more often by individuals. Derived from English common law but with equivalent forms of property rights in civil law.	Commercial land holdings under freehold title in South Africa, Namibia and elsewhere; Smallholder land titles created in Kenya, or upgraded from customary rights by land commissions in Niger.	Not prevalent in rural Africa except where created for settlers during the colonial period, or by express allocation of freehold rights or titling programmes by independent states. More common in urban areas
Leasehold	Long but limited term rental contract (typically 25, 50 or 99 years) on land belonging to the state or private owner; A form of land title backed by the state, and often transactable on the market.	Land concessions for commercial purposes in Mozambique; leases issued by government to customary land users in Rwanda; urban plots in Ghana under lease from customary authorities; tobacco estates leased by government in Malawi.	More common in Africa than freeholds, especially where all land belongs to the state which allocates land on a leasehold basis or creates leasehold title as a means of formal registration of customary rights.
Tenancy	Short-term rental contracts usually between private individuals. May or may not be regulated by formal law.		

Certificates, licences and permission to occupy	Simplest forms of documentation granting land rights issued by the state or other owner; generally temporary and insecure.	Permissions to occupy as yet not upgraded in South African townships.	Widespread but with variable forms of documentation from public and especially private / customary land owners in African cities.
Adverse possession	Secure property rights recognised in law as a result of land occupation over a number of years	One form of legally protected customary rights under Mozambique's 1997 Land law.	Not common.
Squatting	Unlicensed informal occupation, usually on public land (should be distinguished from undocumented land occupation permitted by customary owners.		Widespread in African cities; less common in rural areas
Customary rights: - Group / communal - Family - Individual	Legitimate land rights derived from kinship with or inheritance from members of a land holding group who have established rights historically by clearance or kinship. Customary rules for land access vary widely. Rights held in perpetuity and may be transactable but not on a permanent basis, or not without permission of the group or a customary authority.	In e.g. Ghana rights are considered to be vested in the traditional land holding group, or extended family under a chief. Legal status of individuals' rights may be contested or unclear. In e.g. Uganda and Niger recognised in law and have equal status to freehold.	The predominant form of African land holding, but with varying degrees of freedom to utilise and dispose of land at individual, household or village level according to custom. Where land availability is sufficient, non-farm and unutilised land generally held under Common Property according to customary rules. Customary rights recognised in law in an increasing number of countries but documentary coverage limited.
Derived customary rights: -Sharecropping -Tenancy -Gifts and grants - Loans, pledges and mortgages -Seasonal rights	Rights transferred under customary rules to non-rights holders including women and other family members, community members seeking additional lands and to outsiders, notably migrants. Usually but not necessarily temporary and restricted in character. Originally non-monetary but increasingly monetised.	Various forms of tenancy and sharecropping as in the West African cocoa belt; unregistered customary leases in peri-urban Ghana; seasonal access arrangements.	Very frequent means of land access in customary systems. The predominant form of land access for women, junior family members and migrants. Seasonal land access arrangements common between pastoralists and settled farmers, or sequential use by different pastoral groups.

Source: Drawn from issues paper for the CONSULTATIVE WORKSHOP 27 to 29 March 2006 on land policy in Africa: a framework of action to secure land rights, enhance productivity and secure livelihoods.

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