



A Framework for Agriculture Green Growth

Greenprint for SAGCOT



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A Framework for Agriculture Green Growth:

Greenprint for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT)

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The development of this document was led by a team from EcoAgriculture Partners, reporting to the SAGCOT Centre and the SAGCOT Green Reference Group.

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The **SAGCOT Vision for Agriculture Green Growth** is described in a set of documents produced in 2013. Follow the hyperlinks in the list below to access any of the documents.

A Vision for Agriculture Green Growth in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT): Overview

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A Framework for Agriculture Green Growth: Greenprint for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT)

Jeffrey C. Milder, Louise E. Buck, Abigail K. Hart, Sara J. Scherr, and Seth A. Shames

Green Growth Opportunities for Businesses and Investors: Greenprint for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT)

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Applying an Agriculture Green Growth Approach in the SAGCOT Clusters: Challenges and Opportunities in Kilombero, Ihemi and Mbarali

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Six Opportunities to Green Agricultural Production in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT)

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List of Acronyms

AGG	Agriculture Green Growth
AGRA	Alliance for a Green Revolution in Africa
AIPP	Agricultural intensification with prevailing practices
ASDP	Agriculture Sector Development Programme
ASDS	Agriculture Sector Development Strategy
BAU	Business as usual
CA	Conservation agriculture
CIP	Commodity Investment Plan
CSO	Civil society organisation
DADP	District Agriculture Development Plan
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
GoT	Government of Tanzania
IFAD	International Fund for Agricultural Development
KPL	Kilombero Plantations, Ltd.
NAPA	National Adaptation Programme of Action
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
PASS	Private Agriculture Sector Support
PES	Payment for ecosystem services
REDD	Reduced emissions for deforestation and forest degradation
SACCO	Savings and credit cooperative
SAGCOT	The Southern Agricultural Growth Corridor of Tanzania initiative
SIPP	SAGCOT Investment Partnership Program
SRI	System of Rice Intensification
SRSEA	Strategic Regional Social and Environmental Assessment
TAP	Tanzania Agricultural Partnership
TARIPA	Tanzania Rice Partnership
TzSh	Tanzanian shillings
USAID	United States Agency for International Development
VLUP	Village Land-Use Plan
WUA	Water User Association

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1. Introduction

Southern Tanzania is a region of rich resources and great potential. It contains some of the country's most fertile lands, extensive forests and wildlife, and access to water, and is served by a backbone infrastructure of paved highways, rail, and electric transmission lines. Yet, the region suffers from low productivity, high poverty, worsening environmental degradation, and a host of unfulfilled promises. Recent trends suggest that without bold action, these problems will likely only get worse.

However, a different future is possible, one that develops southern Tanzania into a major regional food producer and engine of national economic development, dramatically reduces poverty among its nine million residents, protects the rich biodiversity that underlies a dynamic tourism sector and sustains the region's ecosystems as the productive base of future wellbeing. This document describes that future—and a framework for developing strategies to achieve it.

With the multitude of challenges and opportunities facing southern Tanzania, a 'silver bullet' approach to economic growth is neither possible nor desirable. Instead, the region needs an integrated strategy that aligns investment in land and natural resources to support agriculture, livestock, and forestry, as well as wildlife tourism, industrial development, and other sectors.

At the heart of this strategy must be agriculture. Agriculture is the mainstay of Tanzania's economy and culture, providing primary income for up to 85 per cent of Tanzanians. Recognizing this importance, the Government of Tanzania (GoT) has launched important new initiatives to support increased agricultural productivity. In 2006, the GoT unveiled its Agriculture Sector Development Strategy (ASDS) and corresponding Agriculture Sector Development Programme (ASDP) to increase government support for green revolution in Tanzania. This Programme is targeted to meet local needs—identified through participatory priority-setting exercises at the district level—and backed by major new financial commitments. In 2009, the GoT launched Kilimo Kwanza (Agriculture First), a complementary strategy for engaging the private sector in agricultural development.

Meanwhile, at the international level, leading private companies were converging around the idea that responsible new private investment in agriculture in the developing world—directly engaging small-scale farmers—could be a key to accelerating poverty reduction and food security where these were most needed.¹ And, based on patterns of agricultural land management and potential for yield gains, global food and development experts were emphasizing the importance of supporting smallholders as key agents in a future renaissance of African agriculture.

Nowhere in Tanzania is the potential for sustainable intensification of agriculture greater than in the Southern Corridor, a vast region of nearly 300,000 square kilometres (about one-third of the nation's territory) stretching from the Indian Ocean to the Zambian border, along both sides of the infrastructure backbone of roads, rail, and electrical power that extends inland from Dar es Salaam (see Figure 1-1). The region boasts many areas of good soils, adequate rainfall or potential for irrigation, and access to domestic, regional, and international markets, and is home to around 9 million people.

¹ This idea, and a roadmap for implementing it, were presented, among other places, in a report entitled 'A New Vision for Agriculture,' first published by the World Economic Forum in 2010.

The SAGCOT Initiative: Concept, strategy, and ambitions

In 2010, these threads were woven into whole cloth with the launch of the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) initiative by President Jakaya Mrisho Kikwete at the World Economic Forum (WEF) in Davos, Switzerland. Since its launch, SAGCOT² has generated widespread interest and hope as a model for African agricultural development that can dramatically increase food supplies, reduce poverty, and stimulate economic development. The initiative has been featured prominently at major international forums including the UN Climate Change Convention Conference of the Parties, G8 Summit on Agriculture, and regional WEF events.

The SAGCOT vision is spelled out in the SAGCOT Blueprint, a strategy for scaling up productive, profitable commercial agriculture in the Southern Corridor over the next twenty years. This strategy is centred on three key features:

1. Public-private partnership

Several barriers currently inhibit the competitiveness of Tanzania's agriculture sector, from spotty input supply chains to poor roads to business-unfriendly policies. To overcome these substantial barriers to investment, the Blueprint calls for coordinated, co-located investments by multiple public and private actors. These investments will include farm development and improvement, post-harvest processing, storage and distribution facilities, infrastructure, research and extension, as well as policy reform.

2. Cluster concept

Core to the SAGCOT strategy is the 'cluster' approach, which posits that greater progress can be made by co-locating different types of investments in specified priority areas. Such clustering creates essential vertical integration of agricultural production, processing, and marketing, while ensuring a critical mass of demand and supply to sustain full-service agricultural input supply chains, post-harvest value chains, and support functions. The Blueprint identified six clusters as especially ripe for investment (see Figure 1-1), although the initiative is not limited to these clusters, and additional geographic focal areas have since been proposed.

3. Attention to benefits for smallholders

Agriculture in the Southern Corridor is dominated by small-scale farmers. This is the population segment that also suffers most acutely from poverty and food insecurity. The SAGCOT strategy seeks to benefit smallholders by helping them increase farm productivity and engage in commercial value chains. This would be achieved through participation in outgrower and block farming schemes oriented around nucleus large-scale farms, and through greater access to inputs, extension, and more favourable post-harvest marketing opportunities.

Together, these approaches are meant to 'kick-start' private sector activity to overcome the initial high costs and risks of agricultural development in the Southern Corridor. The Blueprint envisions a development program that, by the year 2030:

- Brings an additional 350,000 hectares of land into commercial agricultural production, serving regional and local markets;
- Attracts US \$3.4 billion (5.1 trillion TzSh) of new investment, more than 80 per cent of which would be private investment;
- Increases regional production by 630,000 tons of rice, 680,000 tons of other grains, 4.4 million tons of sugar cane, 3,500 tons of red meat, and 32,000 tons of fruits and vegetables;

² Note: The acronym SAGCOT is used in this report to refer to the SAGCOT Initiative. The geographic area defined as the Southern Agricultural Growth Corridor of Tanzania is referred to as the 'Southern Corridor.'

“SAGCOT aims to facilitate the development of clusters of profitable agricultural businesses [that] result in strong synergies across the agricultural value chain, helping create the conditions for a competitive and low-cost industry.”

— SAGCOT Blueprint

- Provides new annual farming revenues of US \$1.2 billion (1.8 trillion TzSh);
- Engages tens of thousands of smallholders in irrigated commercial agriculture;
- Provides more than 420,000 new jobs in the agricultural value chain, and lifts more than two million people out of poverty; and
- Ensures regional food security for a growing population through gains in agricultural productivity, processing and distribution.

To collaborate in unplugging the bottlenecks to productive agriculture in the Southern Corridor, SAGCOT partners recognize the need to foster a new climate of partnership and trust. To this end, the SAGCOT Centre was established in 2011 to play a coordination and facilitation role for the initiative. Under the slogan of ‘business as unusual,’ the Centre is building a platform for public-private collaboration that brings together key public and private actors, from farmers and local businesses to international investors and high-level government officials. As of early 2013, dozens of domestic and international companies had begun new investment planning.

Agricultural development, environment, and climate change

Productive agriculture in the Southern Corridor is not possible without a suitable climate, sufficient water, and fertile soils. More than in many places, farmers in the Southern Corridor depend heavily on a healthy environment: over 95 per cent of the region’s farmers practice rain-fed agriculture, and most use little or no chemical fertilizer, pesticide, or herbicide. Fortunately, many parts of the Southern Corridor are richly endowed with potentially productive agricultural soils; areas of good rainfall, surface and groundwater resources; and healthy forests and grasslands. But these resources are unevenly distributed, finite, and already significantly exploited. For instance, even at currently modest productivity levels, water in the upper reaches of the Great Ruaha River basin is fully exploited by rice farmers, leaving insufficient water for wildlife and hydroelectricity generation. In many places, unsustainable management has led to degradation that reduces the land’s productive capacity to produce food and support farmer livelihoods.

In short, to meet the goals of the SAGCOT Blueprint to achieve productive agriculture on a sustained basis, the region’s land, soil, and water resources must be used more efficiently to enable economic growth despite limited resources. And activities must be carefully planned to maintain the renewable natural resources that support agriculture. This approach is a departure from ‘Green Revolution’ development strategies of the past, which focused mainly on external inputs and tended to view the environment as irrelevant or even antagonistic to agricultural development. But experience from other countries has shown that approaches to agricultural development focused narrowly on short-term crop yields are liable to create lasting and expensive problems, often without equitably addressing poverty and food security challenges (see Box 1). For this reason, there is a growing consensus that the Green Revolution of this century should take a different approach.

21st century agricultural development strategies must respond to new realities, while learning from the successes, disappointments and unintended consequences of last century’s narrowly defined prescriptions for agricultural intensification. For instance, such strategies should embrace new technologies and management systems that enable farmers to produce more food with fewer inputs, less waste, and less pollution. They must recognize that

“...Development needs must be addressed with sufficient concern for each other, for their impact on our peoples’ quality of life and our countries’ ecological health and productivity, and for the eradication of poverty and inequality.”

— The Gaborone Declaration

climate change will dramatically change agricultural suitability in ways that are not fully predictable, and that the most sustainable and least risky farming systems will be those that easily allow farmers to adapt to changing agronomic, environmental, and social conditions. They should consider that sustainability requires action both on the part of individual farmers and on the part of governments, private companies, and civil society working together at larger scales to maintain healthy watersheds and landscapes. And such strategies must recognize that society now looks to agricultural landscapes to provide a range of goods and services—not just food, but also clean water, habitat for wildlife, energy, forest products, healthy environments for people, stable climate—and that markets increasingly reward farmers for doing so. Development strategies that do not reflect these new realities, are not only antiquated; they are unwise.

Developing a framework for Agriculture Green Growth

With these realities in mind, in 2011 a core set of SAGCOT Centre partners embarked on the process of ‘greening’ the SAGCOT strategy to ensure that:

1. Farmers, investors, and other stakeholders are aware of and can fully capitalize on new opportunities to apply sustainable production, processing, and supply chain practices to reduce costs and risks, increase profit and increase the flow of benefits to local communities;
2. The gains in agricultural productivity and profitability realized by public and private investment in SAGCOT can be sustained indefinitely, even in the face of future climate change and resource scarcity;
3. Agriculture in the Southern Corridor is developed in ways that protect natural wetland, wildlife, forest and water resources, and maintains the benefits that ecosystems these provide to farmers, communities, and the nation as a whole;
4. The SAGCOT strategy fully considers and addresses climate and environmental risks, both to the livelihoods of rural people and communities and to the bottom lines of private and public investors; and
5. The Southern Corridor is developed according to a forward-looking vision of sustainable development that is worthy of emulation elsewhere in Africa.

The Framework for Agriculture Green Growth addresses these goals by defining the key elements and parameters of a strategy for coordinating investment and development in agricultural production, processing, and distribution that is efficient, profitable, sustainable and resilient to climate change, while protecting key natural resources and providing social benefits broadly to the population. We call this approach Agriculture Green Growth (AGG). While AGG incorporates traditional environmental management tools such as environmental impact assessments and regulations, its focus is on identifying and catalysing new opportunities in agricultural production, technical and institutional infrastructure, and conservation and livelihood activities for sustainable economic growth. Thus, this Framework can be considered as a ‘Greenprint’ for SAGCOT that complements the Blueprint by creating a roadmap to meet the goals of the Blueprint while generating environmental and social benefits, and minimizing negative impacts, for all groups of producers, including women, and their communities.

Box 1-1. Learning from 20/20 hindsight: Lessons from agricultural development in Brazil and Asia

As Tanzania crafts its strategy and investments in SAGCOT, it can benefit from lessons learned from agricultural development elsewhere around the world over the past 50 years. Many different development models have successfully increased agricultural production, but with widely divergent impacts on poverty reduction and the environment. Here, we present examples from Brazil and the “Asian Tigers” of South Korea and Taiwan to illustrate some divergent experiences and highlight important lessons for Tanzania.

Brazil’s rapid agricultural growth based on large-scale crop and livestock enterprises in the Cerrado is widely known. This model was premised on large areas of land with very low population densities (less than three people per square kilometre, compared to ten times that in the Southern Corridor) and has caused large-scale deforestation and hydrological disruption. Finding ways to shift land use dynamics and restore ecosystem services is proving difficult and expensive. Less well known are the many successful Brazilian models of small- and medium-size commercial agricultural enterprises in more populated areas. For instance, Brazil has developed impressive production and land management technologies for commercial agroforestry, micro-dosing of agrochemicals, organic production, and minimum tillage for smallholder development that have much lower environmental footprint as well as much more widespread benefits for poverty alleviation.

South Korea and Taiwan experienced rapid agricultural growth in the past 50 years, accelerating most rapidly during the heyday of the Green Revolution in the 1970s. Government-led investment supported, improved and expanded irrigation, increased chemical inputs, and improved seeds. Like Tanzania, the agricultural sector in these countries was dominated by smallholder farmers, so the governments pursued a smallholder-focused growth strategy. This growth is credited with kick-starting a wider process of economic development in both countries through investment of economic surpluses from agriculture in other sectors, development of agro-processing and agriculture-related businesses, and high economic multipliers associated with smallholder development. The model had high environmental costs, however, as irrigation investments were implemented without regard for hydrological systems and over-use of agrochemicals polluted drinking water and commercial fisheries, harmed human health and greatly diminished biodiversity. Soil degradation (salinity, waterlogging, chemical toxicity, hardpan, loss of soil nitrogen) and rising costs of energy and fertilizer have greatly slowed (and in some cases even reversed) yield growth. In the 1990s, both countries began major investments to help farmers shift to more ecologically sustainable agricultural systems and investment in large-scale restoration of degraded resources.

Southern Tanzanian farmer, business and government leaders can usefully review these experiences and draw from them the elements that are likely to have the greatest benefits for food supply, poverty alleviation, economic development, and ecosystem health in both short- and long-term. Recent major international assessments and recommendations on future pathways for agricultural development identify a myriad of ways to pursue smallholder-focused strategies contributing to agricultural green growth, drawing on the latest science and innovation from the field. These contemporary approaches appear capable of providing the widespread yield gains of earlier Green Revolution approaches, with far-reaching livelihood benefits, but with greatly reduced negative impacts on the environment and human health, and with greater foresight to a future of high energy prices, water limitations, and climate change to which farmers will need to adapt.

The Greenprint was developed from October 2011 through August 2012 by the SAGCOT Green Reference Group, SAGCOT Centre, and other stakeholders, with facilitation and technical support from EcoAgriculture Partners. The process was designed to embody SAGCOT’s motto of ‘business as unusual’ by bringing together key stakeholders from all levels (from smallholder farmers and village leaders to high-level government officials and international investors) and all relevant sectors in an environment of maximum transparency. Throughout the process, a web-based Agriculture Green Growth Portal and listserv were used to share project documents, Green Growth ideas and opportunities to build interest in the Green Growth concept and invite input into the Greenprint development process.

The process included four main activities. First, the Green Growth team conducted an assessment of agriculture, environment, and climate conditions, trends, and challenges for the Southern Corridor to inform key needs and opportunities for the Greenprint. Second, the team conducted a consultation process with key SAGCOT stakeholders and experts to understand existing Green Growth activities, opportunities and barriers in the corridor. This process included field work and spatial mapping for three of the SAGCOT focal clusters, more than 150 in-person and telephone/Skype interviews, and ‘electronic consultation’ via the Agriculture Green Growth Portal and listserv. Third, the team facilitated a three-day Green Growth Leaders Workshop in Dar Es Salaam in May 2012 to enable cross-sectoral discussions on the emerging Greenprint and identification of additional investment opportunities. This workshop resulted in a wide range of innovative ideas and some emerging consensus about AGG development priorities in each cluster.³ Then the Greenprint itself was developed in draft form and reviewed publicly by SAGCOT stakeholders; this feedback was addressed and the report finalized. Ongoing efforts of the SAGCOT Centre, GoT, and other partners are now critical to ensure that the ideas in the Greenprint are mainstreamed into investment and policy decisions throughout the Corridor.

Overview of the SAGCOT Greenprint

The SAGCOT Greenprint defines a vision for scaling up Agriculture Green Growth in the Southern Corridor, with benefits for farmers, communities, investors, and the United Republic of Tanzania. Following this Introduction, Chapter 2 explains the need for a Green Growth approach by highlighting key conditions and trends in the Southern Corridor that will affect the implementation of the SAGCOT Initiative and clarifies how the Greenprint aligns with and builds on the SAGCOT Blueprint. Chapter 3 provides a ‘bird’s-eye’ view of existing conditions related to agriculture, environment, and climate in the Southern Corridor as background for the strategy.

At the heart of the Greenprint, Chapters 4 through 6 lay out an operational strategy for implementing AGG for SAGCOT. Chapter 4 identifies a set of ‘best-bet’ AGG opportunities and defines the actions and investments needed to mainstream these in the Southern Corridor. Chapter 5 highlights the key supporting activities, institutions, and policies needed to facilitate the broad uptake of AGG. Chapter 6 addresses the challenge of financing and investment generation. Chapter 7 presents a vision of what a successful Agriculture Green Growth development program could achieve by the year 2030, and Chapter 8 outlines the next steps for the SAGCOT Centre and its partners to implement the vision.

In the interest of keeping the Greenprint itself concise, detailed supporting materials are provided in separate documents. A special report was prepared for the business and investment community, as well as a document providing additional detail about six AGG innovations ready for investment, and another scoping AGG challenges and opportunities in the three Clusters of Ihemi, Kilombero and Mbarali. Terms of reference for follow-up activities to implement the Greenprint were provided for consideration in the SAGCOT Centre’s 5-year action plan. The Overview of this Greenprint (above) was also published separately for easy dissemination.⁴

³ For a summary of the workshop and key outcomes, please see the workshop report, available from the SAGCOT Centre or at www.AgricultureGreenGrowth.com.

⁴ Full references and web-links to these documents may be found at the beginning of this report.



2. Why Green Growth for SAGCOT

In the Southern Corridor, nearly the entire economic base—from agriculture and livestock to tourism, mining, and forestry—depends on sustaining ample clean water, fertile soils, healthy ecosystems, and wildlife, as does the well-being of the population. This chapter highlights key conditions and trends in the Corridor that necessitate a Green Growth approach to meet the objectives of SAGCOT. The chapter reviews some of the existing commitments to Green Growth in Tanzania, and illustrates how the Southern Corridor can serve as a flagship region for carrying through on these commitments.

The concept of Agriculture Green Growth

Around the world, governments, civil society, and the private sector are working together to develop and implement ‘Green Economy’ and Green Growth strategies to generate equitable, sustainable economic development. These strategies stem from an understanding that finite resources and a new climate of opportunities and risks necessitate new, green development strategies. The precise rationale and need for Green Growth differs from place to place, depending on a country’s development ambitions, environment, and other conditions.

The Framework for AGG identifies current and emerging opportunities for harmonizing agricultural development and regional food security with local poverty reduction and ecosystem conservation. The framework proposes a model for partnerships between international and national investors, national and local governments, and civil society including farmers, local communities and NGOs to develop a set of investment principles, and design institutional arrangements and investment strategies that improve the delivery of economic, social and environmental benefits through agricultural development. The framework also identifies promising technologies and innovations for transforming the agricultural sector which recognize ecosystems as key productive assets. The AGG framework positions the agriculture sector as a principal engine for human and economic development within an overall national Green Economy or Green Growth strategy (see Box 2-1).

Nine reasons for greening SAGCOT

This section highlights nine key factors that will be especially important in shaping and constraining development opportunities in the Southern Corridor in the coming years, and that the Greenprint framework seeks to address.

1. Resource-conserving agriculture is the best—and in some places the only—way to harness the Southern Corridor’s agricultural potential.

Portions of the Southern Corridor are blessed with adequate rainfall, surface water, and suitable agricultural soils. But very little of the region is free from at least one major agricultural constraint. For instance, many of the soils in the Corridor are heavily subject to erosion, require enhancement of soil organic matter to attain viable yields, or requires application and management of specific macronutrients. Farmers may attain short-term yields through slash-and-burn agriculture or nutrient mining (i.e., farming nutrient constrained soils without managing or replacing nutrients lost through harvest or erosion), but in the long run, this approach will only exacerbate poverty, land degradation, and deforestation.

Intensification and large scale mechanization can result in more efficient input use, as well as decrease pressure for clearing new land for agriculture. However, sustaining ongoing productive agriculture on most lands will require careful stewardship of soils and water resources. Practices such as soil surface conservation, mulching, no-till agriculture, integrated grazing management, and precision application of water and nutrients are cost-

Box 2-1. Key concepts and terms related to Agriculture Green Growth

Green Economy refers to economic development that improves human well-being and social equity while reducing environmental risks and scarcities.¹ As a contemporary form of sustainable development, the green economy recognizes the monetary and non-monetary values of ecosystems for human well-being, and incorporates these values into strategic decision-making. A green economy also emphasizes the importance of resource use efficiency, reduced carbon emissions and inclusive growth benefitting all sectors of society. The Green Economy concept has been championed by the United Nations Environment Programme and adopted in numerous developing countries, including Brazil, Indonesia, Kenya, and Rwanda.

Green Growth is a similar concept that links economic growth and human wellbeing in all sectors (food production, energy, water, transport, housing, etc.) to sustainable resource management. The OECD championed Green Growth in 2009 as a strategy to steer the world's development trajectory toward more sustainable, less risky growth in the wake of the 2008 world financial crisis.² The concept has since been incorporated into national development strategies in more than a dozen countries.

Integrated landscape management refers to approaches or strategies for achieving multiple objectives related agricultural production, ecosystem conservation and sustainable natural resource management, and human health and well-being across a landscape by strengthening institutions and supporting collaborative, multi-stakeholder management processes. A recent review undertaken by EcoAgriculture Partners, ICRAF and TerrAfrica identified more than 85 integrated landscape management initiatives active in Africa.

Climate-smart agriculture is an approach to food production that sustainably improves productivity, increases resilience (i.e., climate change adaptation), and reduces net greenhouse gas emissions (i.e., climate change mitigation) while enhancing the achievement of national food security and development goals. Major agricultural development and funding agencies (e.g., the FAO, World Bank, IFAD, and many international NGOs) have recently incorporated the principals of climate-smart agriculture into many of their investments to ensure that agricultural development yields long-term livelihood and food security gains, even in the face of climate change.

Sustainable intensification is a broad term referring to strategies that increase the amount of food produced per unit of land, but without negatively affecting the environment or resource base. Whereas conventional strategies intensify agriculture by applying more chemical fertilizer, pesticides, water, and energy, sustainable intensification does so mainly by improving input use efficiency and promoting ecological processes (e.g., nutrient cycling, soil fertility, water harvesting, pest control, and pollination) that increase the biotic and abiotic productivity of the farm. Sustainable intensification can combine these ecologically-based practices with judicious use of modern technologies and practices, including agrochemicals, hybrid or genetically modified seeds, and modern farm machinery.

1 Definition of the United Nations Environment Programme.

2 See "Towards green growth: a summary for policy makers," 2011, OECD.

effective and fully applicable to small-scale, low-input farms as well as to large-scale mechanized agriculture. Unfortunately, only 0.3 per cent of funds allocated by the Ministry of Agriculture, Food Security and Cooperatives to support the DADPs goes to support soil and water conservation. New commitments are needed to achieve sustainable intensification of agriculture.

2. The well-being of smallholders depends on resilient, resource-conserving farming systems and diversified livelihoods.

In general, smallholder agriculture depends heavily on local natural resources to support productivity, whereas large-scale farms tend to make greater use of chemicals input, fossil fuel energy, and machinery. By the same token, smallholders tend to be more susceptible to climate change, drought, and other shocks than are large-

scale farmers, who may have greater access to irrigation, capital, labour, and input and output markets that can serve as buffers against disaster. For Green Growth to be successful, investors will need to demonstrate that agricultural development will build social equity through job creation, as well as local and regional food security. This also means a more concerted effort is needed to support women farmers, who play a growing role in the economy, but have been disadvantaged in terms of access to land, resources, finance and markets.

The SAGCOT Blueprint proposes to increase access of smallholder farmers to irrigation, inputs, and markets that can help buffer against certain risks. However, these changes will initially reach only a minority of smallholder farmers. For instance, less than 3 per cent of farmland in the Southern Corridor is irrigated, and even by 2030 the projected area remains below 10 per cent, with irrigation focused on commercial farms. Similarly, fewer than 3 per cent of smallholders are expected to gain access to input supplies, farm services, and output markets through their participation in outgrower schemes or block farms linked to commercial farming hubs. An important complementary strategy for mitigating risk and improving livelihoods is to work with farmers associations and rural communities to diversify farming systems with multiple crops and varieties and to use resource-conserving agricultural practices. This approach can also benefit smallholder farmers engaged in outgrower schemes and block farming by reducing their dependence on a single crop, increasing income flows, and improving household nutritional status.

3. Limited water resources in the Corridor can yield the greatest economic benefit if they are strategically planned, allocated, and managed.

While portions of the Southern Corridor now have adequate rainfall or surface water to support productive agriculture, adequate water supplies will also be needed to generate power to support infrastructure and business activities. Currently, there are plans to build seven new dams and reservoirs, and eight new irrigation systems throughout the Corridor. As demand grows, scarcity and conflict inevitably will grow as well. In fact, even at current production levels, conflicts have arisen related to water use among key sectors including crop agriculture, livestock, hydroelectric power, wildlife/tourism, and urban use. For instance, irrigation water use in the upper reaches of the Great Ruaha basin has resulted in the extinguishment of dry season flows downstream, in the Great Ruaha National Park, where the tourism industry depends on such flows to attract large game to seasonal water supplies. Upstream agricultural water use has also reduced reservoir levels at the Mtera Dam, contributing to blackouts that cost Tanzania nearly one trillion TzSh per year. Hydropower shortages—primarily in the Southern Corridor—will worsen under projected climate change scenarios, costing the country a loss of 0.7-1.7 per cent of its GDP by 2030.¹ The situation could be improved by increasing irrigation water use efficiency in the Usangu Flats, which currently stands at just 24 per cent for dry-season crops.

A draft Strategic Regional Environmental and Social Assessment (SRESA) commissioned by the World Bank highlights expanded irrigation as one of the foremost risks associated with agricultural development in the Corridor. Without a more comprehensive, efficiency-oriented approach to water resource management, it is very unlikely that the Southern Corridor could support the levels of irrigation and food production proposed in the Blueprint, let alone set aside enough water to support critical economic growth in other sectors including wildlife and tourism. A central tenet of Green Growth is to optimize the economic and social benefit gained from a limited renewable resource such as water. Doing so will require a SAGCOT strategy that: 1) accurately assesses and monitors available water resources; 2) efficiently and fairly allocates water use among key sectors; 3) increases water use efficiency in each sector, but particularly in agriculture, where the greatest gains may be realized; and 4) increases water availability through effective watershed management.

¹ World Bank, 2006. Water Resources in Tanzania: Sustainable Development of Tanzania's Water Resources. World Bank Tanzania Country Office. World Bank, Washington, D.C., January.

4. Tanzania is one of the world's great centres of biological diversity—a heritage with enormous value for the economy, culture, and national identity

Tanzania is regarded as one of the most important countries on mainland Africa for conservation, unique due to its breadth of ecosystems and unparalleled number of endemic species. It is home to iconic game species and famed safari circuits. Within the Southern Corridor, the Eastern Arc Mountains are among the most biodiverse places on earth, home to three species of monkey and more than 450 species of plants found nowhere else in the world. Species new to science are still frequently discovered in these mountains and its wealth of genetic diversity is a rich resource of international importance. The direct contribution of nature tourism to appreciate these resources accounted for 4.8 per cent of gross domestic product of Tanzania in 2012 and 25 per cent of total export earnings.

Unfortunately, these valuable resources are all threatened. Rampant deforestation is destroying more than 400,000 hectares of native habitat annually across Tanzania, while wildlife populations are further threatened by habitat fragmentation, hunting, grazing, and other activities. Sadly, much of this deforestation contributes little to the national economy, serving mainly to support subsistence livelihoods for people who have few other alternatives. With its abundance of protected areas, biodiversity hotspots, and wildlife corridors in close proximity to high-potential agricultural land (including in the priority clusters), the Southern Corridor exemplifies the challenge of achieving agriculture-led economic development while conserving Tanzania's critical ecosystems and biodiversity (see Figure 2-1).

Fortunately, conservation can be compatible with a Green Growth strategy for robust economic growth and poverty reduction. Agriculture and livestock production can be sustainably intensified to a degree that greatly reduces the need for further expansion into high conservation value habitats. Sustainable energy alternatives can increase energy efficiency and significantly reduce fuelwood and charcoal demand, and pressure on scarce water resources. Green Growth creates opportunities for the private sector to tap into the conservation communities' deep knowledge of the region's resources and challenges, and forge new partnerships that will strengthen conservation activities as well as economic development. Thus pressure on the nation's ecosystems and biodiversity can be reduced, strengthening these assets to support tourism, recreation, and an enduring source of national pride.

5. Effective land use planning is needed to reduce conflict, attract beneficial investment, and maintain a productive resource base for agriculture and protect environmental assets

Land use and land rights in Tanzania are governed by a complex and sometimes contradictory mosaic of policies, institutions, and planning processes. Too often, this situation results in a lose-lose scenario that provides too little certainty for investors, too little protection for communities, and too little coordination among different sectors and investors that are each making their own plans. Land conflicts between agricultural communities, pastoralists, and commercial farms continue to escalate, and serve as a disincentive to outside investment. The nation's process for participatory Village Land Use Planning has yielded positive results in many places where it has been applied, but plans have been developed for less than 10 per cent of Tanzania's villages.

As with water resources, a Green Growth approach to land resources seeks to optimize total benefit through cross-sectoral planning that locates land uses in the most suitable location. This approach helps reduce conflict between uses such as agriculture, grazing, wildlife management, industrial development, and mining. Pro-active planning is key to establishing a 'land bank' of sites where agricultural investment is physically suitable and welcomed by local communities. In this way, planning can increase opportunities and reduce pre-development costs for investors.

6. Energy supply presents a major challenge and opportunity for the future of the Southern Corridor

Fuelwood and charcoal provide 92 per cent of Tanzania's total energy, while fuelwood is the primary fuel for tea drying, tobacco curing, and other key agro-processing in the Southern Corridor. This high reliance on bioenergy is predicted to remain very high for the foreseeable future.² As a major economic activity and land use in the Southern Corridor, bioenergy harvesting and use is a key factor that must be addressed if the region is to achieve a sustainable growth trajectory. At present, the bioenergy sector is a primary driver of Tanzania's high deforestation rate, and competes with agriculture for limited land, water, and biomass resources.

However, with the right incentives, training, and support, farmers, rural communities, and businesses in the Southern Corridor can produce bioenergy sustainably to provide energy for local use and domestic markets. Biogas, woodlots, agroforestry, crop residue management, and others practices and technologies can help support agriculture, livelihoods, and forest conservation. A Green Growth approach pursues such synergies between the energy, agriculture, and forestry sector, with the added benefit of reducing net carbon emissions associated with economic development and population growth. Increased household energy use efficiency (e.g., improved cookstoves) is an additional solution that generally results in cost savings while reducing energy demand and carbon emissions.³

7. With climate change, agriculture suitability is shifting in important ways

The precise impacts of climate change in the Southern Corridor in the coming decades are difficult to predict. Models suggest that by 2050, temperatures will rise by 1-3°C, maize yields could decline 20-40 per cent, while some mid-altitude crops (such as coffee) could see productivity gains. What is already apparent to many of the region's farmers is that climate change is resulting in more seasonal and annual variability in rainfall patterns, higher temperatures, less overall climate predictability and a corresponding increase in risk. A recent nationwide assessment predicted that climate change could dampen Tanzania's GDP growth by 1-2 per cent per year by 2030. To counter this risk, investments of at least US \$600 million per year are needed to build adaptive capacity against current and future climate risks.

Some farmers are beginning to adapt to climate change by shifting to drought-resistant crops; others are experimenting with different varieties and planting schedules. But adaptation for agriculture requires a comprehensive approach that includes actions at the farm, community, and regional level. Such actions should engage not only the agriculture sector but also policies and programs related to forests, water, infrastructure, and community development. Green Growth explicitly considers climate change in development and investment planning, seeking to minimize future risks to economic prosperity and especially to poor and vulnerable populations.

8. Agricultural development should not undermine development in other sectors, or vice versa

Tanzania's Development Vision 2025 and the corresponding National Strategy for Growth and Reduction of Poverty (MKUKUTA) present a comprehensive development vision that aims to achieve middle-income status for Tanzania by 2025 by pursuing aggressive growth in all major sectors. Doing so requires that each sector have access to the critical means of production (raw materials), infrastructure, and capital needed for its growth. As noted above, agricultural expansion—if not carefully planned, located, and managed—may negatively compete for land, water, and other resources needed to support growth in tourism, mining, urban and industrial

² FAO sustainable woodfuels report; Tanzania National Energy Policy (2003).

³ Among the climate mitigation options with negative net cost, efficient use of biomass and charcoal in domestic cooking is capable of providing the largest emissions reductions, totalling an estimated 13 million tons of CO₂-equivalent per year by 2030. Source: "Opportunities for Low Carbon Investment in Tanzania" (2010).

development, and other sectors. If gains in agriculture are offset by reduced growth in other sectors, it will be difficult to fulfil the promise of MKUKUTA.

On the other hand, a Green Growth approach to agricultural development could actually support synergistic growth in other sectors. Water-efficient agriculture would leave aside enough water for hydropower, industry, households and local processing, and environmental uses, while best management practices in agriculture would ensure that downstream waters are clean for human and livestock use. Wildlife-friendly design of agricultural regions would enable large game to migrate across the landscape, sustaining abundant wildlife populations to support tourism growth. And sustainable intensification of agriculture on existing lands could enable more forests to be reserved for sustainable forestry, tourism, or sale of carbon credits.

9. Farmers and investors in the Southern Corridor stand to benefit from new business opportunities related to sustainable production, processing, and marketing—but only if they choose to deliberately pursue these opportunities

Increasingly, markets for agricultural goods are differentiating raw commodities and consumer products based on the way in which these goods were produced. Voluntary agricultural eco-standards have grown exponentially in the past decade, while similar sets of criteria are now being mainstreamed into sourcing policies for major agribusiness companies and even into public policy. The trend toward sustainability standards began with high-value export crops such as coffee and tea, but is rapidly expanding to include commodities such as sugar, soy, cattle, and various biofuel feedstocks. While sustainability standards remain most important for export to developed countries, developing country domestic markets and south-south trade are now expanding. In addition to opening up new market opportunities to attain higher prices and preferred market access, as well as generating new employment opportunities, adherence to sustainability criteria and agricultural best management practices is often worthwhile in its own right, by assisting producers in reducing waste and increasing efficiency and productivity.

The business case for AGG

One important difference between AGG and business-as-usual is that AGG incorporates ecosystem values and social equity considerations into decision-making for public- and private-sector investors. Under business-as-usual, investment decisions are typically informed by standard financial models, which treat environmental and social factors as “externalities” that are irrelevant to the financial analysis. Historically, most private sector decision-makers considered such factors only when they were compelled to by public policies and regulations. In recent years, international investors and financial institutions have increasingly signed on to new sets of guidelines for good conduct, such as the Equator Principles, which set minimum standards for the social and environmental impact of investment.

But the calculus for private investment is now changing more radically, as companies come to recognize that environmental and social factors constitute key risks and opportunities for the profitability and long-term viability of their business models. For instance, water-efficient agriculture can help companies improve the reliability of agricultural raw material supplies, and reduce the risk that climate change or drought will result in shortages. Precision application of water and agrochemicals can reduce input costs and increase profit. Engagement of rural communities in cooperative food-growing, processing and marketing ventures can reduce the risk of local conflict around a commercial farm. And improved social and environmental performance of the agricultural supply chain can translate into product differentiation and marketing advantages that can boost market share or price at the wholesale and consumer level.

In response, investors have begun to use a range of planning and analysis tools to incorporate environmental and social risks and opportunities into investment decision-making.

While the term Agriculture Green Growth is new, the AGG concept encompasses a number of well-proven sustainable farming practices and systems, many of which are very suitable for the Southern Corridor (see Chapter 4), and would provide reputational benefits to investors by mitigating the significant social and environmental risks identified in the Strategic Regional Environmental and Social Assessment (SRESA). AGG therefore overlaps substantially with other modern concepts of sustainable agriculture, such as climate-smart agriculture, sustainable intensification and integrated landscape management (see Box 2-1). AGG coordinates agricultural development with development of other sectors in order to achieve new synergies in support of overall national development ambitions.

Agriculture Green Growth outcomes and beneficiaries

The AGG strategies in the Greenprint aim to provide benefits for four key groups: small-scale farmers; private companies and investors; rural communities; and the United Republic of Tanzania as a whole (Table 2-1).

Table 2-1. Opportunities and actions for scaling-up conservation agriculture

AGG Beneficiaries	Key AGG Benefits
Small-scale farmers	- Increased agricultural yield and income - Improved health and nutrition - Improved livelihood security and resilience
Private-sector companies (investors)	- Increased profitability - Reduced risk - Long-term sustainability of their resource base
Rural communities	- Greater food security - Improved human development (health, education, welfare) - Reduced conflict among land and water users - Increased diversification of local economies - More secure access to water, energy, wild products
United Republic of Tanzania	- National food security - Expanded export agriculture sector - Agriculture contributes significantly to national development objectives (e.g., MUK...) - Agricultural development supports, and does not inhibit, development of other economic sectors - Improved "natural capital" as the base for continued sustainable economic development

Consistency with national and community priorities

Tanzania has already taken steps toward a Green Growth approach to development in key policies and initiatives, although not all of these have been fully implemented (Box 2-2). At the highest level, the National Strategy for Growth and Reduction of Poverty (MKUKUTA) advocates a strong focus on sustainable natural resource management and inter-sectoral coordination to achieve broad-based, lasting growth. Current climate change planning activities encompass key Green Growth principles of increasing the adaptation and resilience of farmers and communities while reducing greenhouse gas emissions.

The agriculture and livestock sectors have embraced a participatory approach to priority setting and have launched important initiatives related to sustainable intensification of agriculture. In the forestry sector, there is a strong

tradition of community-based management that can empower and incentivize local management of forest resources for conservation and income generation. And, stemming from Tanzania's tradition of cooperatives, there is a dense network of farmers groups, credit cooperatives, and other local associations equipped to support agricultural growth that directly benefits poorer households.

What has not yet fully developed is a close and flexible interface between different sectors and ministries, and between actors operating at different scales, to ensure that policies and programs are harmonized and generate positive synergies.

Box 2-2. Building on a solid foundation: Some existing initiatives and policies that support Green Growth in Tanzania

National Strategy for Growth and Reduction of Poverty (MKUKUTA)

- MKUKUTA emphasizes agriculture as a key sector for economic development and poverty alleviation. The strategy prioritizes several Agriculture Green Growth interventions, including improved water management and rainwater harvesting, research and development to improve crop quality and crop insurance and other protections against drought and famine. Farmers groups, cooperatives, and women are highlighted as central actors in agricultural development, to be supported by new training, support, and access to credit. MKUKUTA also calls for improved natural resource management to reverse land degradation, reduce biodiversity loss, and increase contributions from wildlife, forestry, and fisheries to rural livelihoods.

Agriculture:

- Kilimo Kwanza (Agriculture First), developed under the Comprehensive Africa Agriculture Development Plan (CAADP), is the Tanzanian government's policy to spark a green revolution in Africa by establishing agriculture as a top-priority by boosting government spending and targeting smallholders. The policy calls for a rearrangement of government institutions and funding mechanisms that will facilitate public-private partnerships, support agricultural research, and shift public thinking to recognize agricultural development as a key component of poverty reduction and food security.
- Agriculture Sector Development Programme (ASDP) is a basket fund established by several international partners along with the Tanzanian government to boost the development of the agricultural sector. Funds are distributed based on District Agricultural Development Plans (DADPs), which help to guarantee local participation and invite investments that are tailored to local conditions.
- Tanzania Agriculture Partnership (TAP), a public-private partnership, was developed in 2006 to coordinate district-level activities to improve the production and marketing of stakeholder-selected crops. The original focus of the partnership was on improving access to inputs, although the partnership has now expanded to include marketing and financial tools to support investments. A value-chain approach draws in diverse partners to work at district and national levels to meet agriculture and development goals simultaneously.
- The Agriculture Policy of 1997 emphasizes the importance of integrated natural resource management of land, soil, water, and vegetation to maintain a healthy and productive environment.

Forestry and natural resources:

- Both the National Forest Policy of 1998 and the Forest Act of 2002 sanction Participatory Forest Management (PFM), now practiced on more than 3.6 million hectares nationwide. PFM includes both communal management of village forests and community co-management of government forest lands. Both approaches can help reduce deforestation and support Green Growth by giving communities financial incentives and secure rights to sustainably manage forests and surrounding land uses. If REDD+ financing materializes, it could help support PFM at a wider scale.
- The National Environmental Management Act of 2004 supports the National Environmental Policy (NEP) and established the legal framework for instituting environment impact assessments, pollution control, environmental quality standards, and public participation in developing environmental policies and plans. This act gives local government authorities the right to develop Environmental Action Plans (EAP) for protecting environmental resources and mitigation environmental problems under their jurisdiction.

Climate change:

- Tanzania's National Adaptation Programme of Action (NAPA) is a broad, cross-sectoral strategy to enable the nation to prepare for and adapt to climate change. At least seven of the strategy's 14 priority project activities are Green Growth practices for agriculture and rural land management. These include increased water efficiency and water conservation in crop production; afforestation of degraded lands; water harvesting; and improved land tenure systems.
- Reducing Emission from Deforestation and Forest Degradation (REDD) aimed to slow agricultural expansion into forests and the conversion of pasturelands by paying communities for avoided carbon emissions resulting from forest conservation. Now REDD+ provides financial incentives to communities not only for halting deforestation and degradation, but also for engaging in forest conservation, sustainable forest management and the enhancement of forest carbon stocks.

Integrated land and water planning:

- The Land Act and Village Land Act, written in 1999, grant the right to villages to manage customary village lands which compose about 70 per cent of all lands in Tanzania. Under this act villages maintain the right to zone land for forest reserves, investment or agriculture. The National Land Use Planning Commission (NLUPC), created from the National Land Use Planning Act (2007), is responsible for developing and administering land use plans for general lands and reserved lands, which include all gazetted protected areas and land for public utilities. The NLUPC also manages any regional, district or village lands that are not actively managed by their respective governing bodies.
- The River Basin Water Offices cut across administrative boundaries to oversee development and management of water resources in the nine major water basins. Each office is responsible for monitoring available resources, regulating use and issuing permits, collecting fees, and mediating water-related conflicts. The size and location of the basin often dictates if sub-basin Water User Associations (WUAs) and Apex Water Bodies (AWB) or International Basin Authorities take on some of the responsibilities of regulating use and mediating conflicts.
- Since 1975, the Rufiji Basin Development Authority (RUBADA) has existed to coordinate the multi-sectoral development of water resources in the Rufiji Basin. No other river basin in the country has two separate institutions for managing water resources, therefore RUBADA has a unique relationship with Rufiji Basin Water Office (RBWO) with RUBADA focusing on private sector involvement and coordination and the RBWO managing permits, fees, allocation and conflict resolution.

Participatory development:

- Participatory planning and decision-making is a core principle of Tanzania's Development Vision 2025 and of MKUKUTA and has been codified in key sector policies including the Forest Policy of 1998, Wildlife Policy of 1998, and Land Policy of 1995. The agriculture, forestry, and land use planning processes described above are some of the more important ways in which participatory development is carried out in Tanzania.



3. A bird's eye view of agriculture and environment in the Southern Corridor

A clear understanding of current agricultural and environmental conditions and issues in the Southern Corridor is critical for informing a well-founded AGG strategy. This chapter describes the existing conditions, trends, constraints, and opportunities in the Corridor, drawing on document review, expert consultations and field observations of the AGG team, and input of workshop participants.

Land use

Aside from several large protected areas, land use in most of the Southern Corridor is quite heterogeneous, consisting of mosaics of forest, woodland, shrubland, grassland, and cropland. Only a small fraction of the Corridor's cropland is in large, permanent estates; most agriculture is interspersed with other land uses, or in a pattern of shifting cultivation. On the other hand, much of the apparently unoccupied natural land outside of protected areas (and to a lesser extent within protected areas) is in fact used for periodic grazing, cropping, hunting, and gathering of wild products. See Table 3-1 for a summary of land cover within the Corridor.

Agriculture

Agriculture is a primary driver of the Tanzanian economy, accounting for 50 per cent of GDP and employing 80 per cent of the population nationwide and up to 90 per cent in rural areas. The Southern Corridor covers several agricultural strongholds including at least parts of the "Big Four" agricultural regions (Iringa, Mbeya, Rukwa and Ruvuma) which regularly produce a surplus of maize and include two of the nation's most productive wetlands for

Table 3-1. Land cover in the Southern Corridor

Land Cover	Area (sq. km.)	Per cent of Total Land
Urban and other artificial areas	447.9	0.1%
Croplands (crops occupy >70% of areas)	10,134.5	3.3%
Mosaic croplands (crops occupy <70% of area)	71,544.8	23.3%
Evergreen forest	12,841.0	4.2%
Deciduous forest	71,234.7	23.2%
Woodland	57,826.6	18.8%
Shrubland	37,891.7	12.3%
Grassland	31,111.2	10.1%
Wetland	4,316.9	1.4%
Water bodies	10,107.3	3.3%
Total land area	307,456.6	100.0%

Source: ESA Globcover data (2009), classified and analysed by the AGG team

paddy rice – the Usangu plains and the Kilombero floodplain. Besides these two staples, the Corridor produces large quantities of sugar cane, most of the country's potatoes, and significant amounts of groundnuts, tomatoes, onions, pyrethrum and tobacco. Coffee and tea also are grown in highland regions.

Irrigation schemes are an important component of farming systems in some parts of the Corridor, particularly around the Usangu and Kilombero floodplains where river water is easily diverted to supply irrigation to fields. Paddy is by far the most commonly irrigated crop, although sugarcane is also cultivated under irrigation in some basins including the Kilombero Valley. Generally, yields for irrigated crops are much higher as the crop is able to meet the water requirement for growth and, in most cases, farmers are able to plant a dry season crop.

Over the past several decades the national budget for agriculture had declined. However, in the past few years, the international community and the Tanzanian government have expressed renewed interest in strengthening the country's agricultural sector. This interest is sparked by a number of factors including a growing demand for food, a realization that Tanzania's area of potentially arable land could make the country a regional exporter, and the potential of new investments in seeds, fertilizers, pesticides and irrigation systems aiming to close the yield gap in regional staple crops. The government, through its Kilimo Kwanza (Agriculture First) strategy, has mobilized new public financial and technical support, and made a commitment to seek new partnerships and investors to help build the sector.

One of the biggest challenges to boosting the sector's performance is guaranteeing information and technology transfer to smallholders who compose the majority of Tanzanian producers. Since the 1990s, the country has sought to develop the sector through the Agricultural Sector Development Plan (ASDP), a basket fund program established between the government of Tanzania, IFAD and other international donors to set national priorities for sector development. Since district and community level participation in the ASDP is an integral part of poverty reduction, national priorities are tailored to local contexts via district-level plans (DASDPs) that include plans for training and extension, land use planning, expansion of rural finance and market opportunities, and strengthening of local government and community management and monitoring. The DASDPs also seek to build the social infrastructure and support livelihoods through programs focused on gender equality and HIV/AIDS and malaria prevention, all of which affect production through effects on the rural workforce. Investments in infrastructure in DASDPs often focus on updating and improving irrigation systems and roads, while the financial component often focuses on strengthening savings and credit institutions and improving market linkages. Extension activities through district plans tend to take place in farmer field schools or other bottom-up capacity building approaches, which are perceived as more effective for achieving adoption and conveying information-rich technologies and management systems.

Water

The majority of land in the Southern Corridor falls within the Ruaha/Rufiji river basin, the largest basin in Tanzania. The basin contains three main sub-catchments: the Great Ruaha, the Kilombero, and the Luwego. The basin also includes three large wetlands—the Kilombero Floodplain, the Usangu flats and the Rufiji delta—all of which are very important for agriculture. The Usangu flats alone account for 20 per cent of Tanzania's rice production, while the Rufiji river delta feeds the largest mangrove forest in East Africa.

Other river basins in the Southern Corridor include the Wami/Ruvu basin in the northeastern portion of the Corridor, which encompasses the coastal plain around Dar es Salaam and the mountains to the west. The Lake Rukwa basin, in the far western part of the Corridor, is fed by streams that often dry up during the dry season. The shallow Lake Rukwa, which varies in physical and chemical composition throughout the year, is an important source of water during the dry season. The Lake Nyasa basin covers the southwestern portion of the Corridor.

The primary management concerns in the Rufiji basin are restoring year-round flow in some cases and in others, managing water demands during the dry season to ensure that there is adequate supply to agriculture, hydropower and several protected areas which attract tourists and provide critical ecosystem services. Irrigation is the most important consumptive water use in the Rufiji basin, accounting for 7.5 million cubic meters per day in 2006. The long dry season and increasing seasonal variability contribute to competition for water resources between the agriculture and hydropower sectors during some periods of the year. The main crops requiring irrigation are paddy rice and sugarcane. The Rufiji Basin Development Authority (RUBADA) has identified more than 600,000 hectares as potential areas for irrigation throughout the basin, with more than half of the area coming from the Kilombero River Valley.

A key objective both for enabling the expansion of irrigation and reducing water conflict is to improve irrigation efficiency (see Table 3-2). Many existing irrigation schemes need to be updated to conserve water. Although conditions vary throughout the corridor, dry season abstraction is resulting in many streams drying completely for a part of the year. In addition, spatial and temporal variation in rainfall is increasing, apparently due to climate change. Therefore, the challenge is not only to manage water allocation to an increasing number of users, but also to capture, store and protect water resources to mitigate seasonal variation. Also, improved water efficiency for agriculture leaves more water for hydropower, another important water use in the region.

More than 80 per cent of Tanzania's hydroelectric power is generated in the Rufiji basin, at three hydro stations (Mtera, Kidatu and Kihansi) that together generate 464 megawatts (MW). An additional hydro station has been long been proposed for Stiegler's Gorge, inside the Selous Game Reserve. First planned in the 1970s, the plant is now being reconsidered as it could generate more than 2,000 MW, control major damaging floods that tend to occur every few years in the lower Rufiji basin, and open up an estimated 460,000 hectares of land for agriculture, including 80,000 hectares which would be suitable for irrigation. While supported by RUBADA, the project remains somewhat controversial because of the potential negative impacts the project could have on the ecosystem and tourism industry related to Selous Game Reserve. An Environmental Impact Assessment (EIA) and updated cost calculations need to be completed before a decision on the project's feasibility can be made.

The Rufiji Basin Water Office (RBWO), established in 1993, is the primary responsible party for managing formal water rights in the basin. Similar water offices have since been established in other basins, however the majority of the nation's river basins (six of nine) which are international, are managed by international basin authorities rather than the national water office. RUBADA is involved in coordinating development activities among the various sectors in the basin. Other bodies, such as the Sustainable Management of the Usangu Wetland and its Catchment (SMUWC) team and now Raising Irrigation Productivity and Releasing Water for Intersectional Needs (RIPARWIN), have been influential in understanding water use for irrigation and impacts on critical wetlands and downstream flows.

Table 3-2. Irrigation efficiency in different irrigation systems

Irrigation system	Irrigation efficiency	Installation costs
Flooded fields (e.g., rice)	20-50%	Low
Other surface irrigation	50-60% and higher	Low
Sprinkler irrigation	50-70%	Medium-high
Drip irrigation	80-90%	High

Source: Liniger et al., 2001

Biodiversity, forests, and protected areas

Tanzania covers a wide range of ecosystem types from miombo woodlands and savannahs, to montane forests and mangroves. The Corridor, which includes parts of the Eastern Arc Mountains and the Southern Highlands, as well as some of the most important wetlands in the nation, protects critical biodiversity and supports the growing tourism industry in the Southern Circuit. The ecosystems and forests of the Corridor also provide key ecosystem services to support the health of the country's people and the productivity of its enterprises. Forests and protected areas also perform the important role of maintaining large stocks of terrestrial carbon. New management approaches are attempting to recognize the tight linkages between the many functions of ecosystems and forests, to incorporate local people into resource planning and management, and to develop innovative systems that fairly distribute the benefits generated from ecosystems and their services at various scales.

The Corridor is home to more than 11,000 species of plants, 1,100 species of birds, 360 species of reptiles, 350 species of mammals and 170 species of amphibians. Many of these species are endemic to Tanzania (e.g., more than 15 per cent of plant species and more than 40 per cent of reptile species) and many are threatened or endangered. While the region's biodiversity undoubtedly provides a host of ecosystem services to support residents, the charismatic species, particularly large mammals, found in the region's wetlands and forests are also the primary interest of tourists and game hunters who make an important contribution to the regional economy.

Although the Southern Circuit is not as visited as Tanzania's renowned Northern Circuit, tourism and game hunting have grown steadily over the past few decades. In 1991 Selous Game Reserve attracted 1,150 tourists and 115 hunters and generated US \$22,000 and US \$1,245,000 in revenue from each group respectively. By 2001 the total number of tourists to Selous had increased to 4,802 and hunters to 482. That year the groups generated US \$299,000 and US \$3,621,000 respectively.

National Parks, where hunting is not permitted, generate all of their revenue from tourists coming to observe and/or photograph wildlife and biodiversity. The national parks in the Corridor (Katavi, Kitulo, Mikumi, Ruaha and Udzungwa) attracted over 83,000 people—about 8 per cent of all tourists in Tanzania in 2008—of whom 60 per cent are foreign tourists (Sirima 2010). Protecting wildlife and biodiversity could allow these parks to host more visitors and attract a higher percentage of the nation's tourists, generate income that could help fund the management of the national parks and support livelihoods for residents who provide important services to visitors.

Climate change

As described in the Economics of Climate Change (ECC) in the United Republic of Tanzania report, the economic and environmental impacts of climate change in Tanzania, while uncertain, are likely to be large. Overall economic losses due to climate change are expected to equal 2 per cent of GDP each year until 2030. The country can also expect an average increase in temperatures of 2°C by 2050, accompanied by increasing rainfall variability and frequency of extreme weather events such as droughts and floods. The Eastern Arc Mountains may be one of the few areas in the country that will not experience decreased rainfall during the short rainy season. However, other nearby areas—in particular the upper reaches of the Wami-Ruvu and Rufiji basins—will most likely experience a decrease in rainfall, resulting in up to a 10 per cent decrease of water flow to these rivers.

In the agricultural sector, irrigation potential and yield could be the most affected by climate change. The agricultural report produced by the Economics of Climate Change (ECC) for Tanzania estimates that adaptation to climate change in the agricultural sector will cost an additional US \$107 million each year above and beyond current investments to grow the sector. Maize yields are likely to suffer the most from climate change, with an average decrease in yield of 14 per cent by 2030, and 23 per cent by 2050. In the most drought-prone regions, such as Dodoma and Tabora, cereal yield losses could reach up to 80 per cent.. However, these predicted trends are not true for all crops. For instance, coffee yields are expected to increase in the highlands. While the costs

in any case are likely to be high, the uncertainty of the effects of climate change can make specific and targeted recommendations for local action a challenge.

This uncertain future has many implications for investment in the agricultural sector. While Tanzania's greenhouse gas emissions from agriculture (total and per capita) are still relatively low when compared with those from developed countries, maintaining a path toward low carbon growth in agriculture could offer many potential benefits in terms of climate adaptation funding and economic and social resilience of Tanzania smallholders, who form the majority of Tanzania's agricultural work force. The ECC report highlights five areas of potential investment that could support vulnerable populations and protect the sector's productivity: irrigation, soil and water conservation, agricultural research, agricultural extension and improvement of rural roads.



4. Agriculture Green Growth in action

In implementing AGG for SAGCOT, there is no need to reinvent the wheel. An abundance of proven AGG strategies are already in use in the Corridor, in other parts of Tanzania, and elsewhere in Africa and the world. SAGCOT can select from among these strategies and adapt them to the unique contexts of the Southern Corridor. Complementing the Blueprint, the Greenprint focuses on practices and strategies that ensure agricultural development leads to permanent food security gains, and is climate-smart, environmentally sustainable, and synergistic with development of other key sectors.

Chapter 4 focuses on a set of ‘best bet’ AGG opportunities that are ready for scaling-up in the Corridor. These include sustainable crop and livestock intensification; forest, water and bioenergy; and value chain investments that are suitable for large-scale implementation in the Corridor. The chapter also identifies other opportunities that appear promising but require additional research, testing, or improved enabling conditions to be ready to scale-up in the Corridor.

Sustainable crop and livestock intensification

Without intensifying crop and livestock production in the Southern Corridor, it will not be possible to meet food production and food security targets or to arrest and reverse the region’s tragic trends toward environmental degradation. Currently, average yields for major grain crops are very low. Across the 42 districts wholly or mainly within the Corridor, maize yields average less than 1.5 tons per hectare and paddy yields less than 2.3 tons per hectare.¹ Smallholder yields are even lower, with maize production averaging around one ton per hectare. In the livestock sector, the number of animals is increasing without improvements in efficiency, leading to degradation of rangelands and increased competition for seasonal water resources. If yields remain static, at least 550,000 hectares of additional land in the Southern Corridor will need to be converted to agriculture over the next twenty years, simply to meet the subsistence food needs of the Corridor’s growing population. This scenario would have enormous negative impacts on the region’s biodiversity, escalate conflicts over land and water, and significantly increase the Corridor’s greenhouse gas emissions—all without satisfactorily addressing national food security. Intensification of agriculture—increasing yield per unit area—is thus needed not only for food security but also for conservation and climate change mitigation.

Conventional agricultural intensification is achieved by increasing inputs of water, agrochemicals, labour, and capital. Sustainable or agroecological intensification also increases food production per unit area, but further ensures that the increased use of inputs and intensive management practices neither over-extends local resource stocks (e.g., water or soil nutrients) nor pollutes or degrades the environment (e.g., through erosion and chemical runoff) and wherever possible encourages production practices that have positive benefits for biodiversity and ecosystem services. Sustainable intensification achieves these gains by adhering to these principles:

1. **Healthy soils:** Soils (and the vegetative cover of soils) are managed to maintain organic matter, soil biological activity, and soil nutrients that nurture productive crops, while minimizing soil disturbance and erosion.

¹ Data from the Tanzania Ministry of Agriculture, Food Security and Cooperatives, mean data from 2005-2010. By comparison, maize yields average 2.1 tons/ha Africa-wide, 4.7 tons/ha in South Africa, and 9.6 tons/ha in the United States. Rice yields average 2.5 tons/ha Africa-wide, 3.5 tons/ha in Madagascar, 5.3 tons/ha in Vietnam, and 7.5 tons/ha in the United States

2. **Efficient use of inputs:** Water, nutrients, and other inputs are applied at the optimal times and locations to nourish crops, while minimizing loss to the environment. Efficient cropping systems are also less susceptible to climate change and fluctuations because they operate more comfortably within the bounds of the local environmental conditions to sustain rewarding crop and livestock yields.
3. **Efficient management of wastes:** To the extent possible, farms should use ‘closed loop systems’ that recycle energy, nutrients, and biomass through integrated systems (e.g., crop-livestock-fish), composting, bioenergy generation, and other practices. Doing so reduces input costs as well as waste and can sometimes provide economically valuable raw materials.
4. **Complementarity:** Sustainable intensification often combines external inputs with ecological management of on-farm assets. For instance, mulching, composting, cover crops, and organic fertilizers can all improve soil quality and structure, while chemical or bio-fertilizers can boost macronutrient availability and rectify micronutrient deficiencies when necessary for optimal plant growth. Examples include integrated pest management and integrated nutrient management.
5. **Diversification:** The above principles are more easily achieved by diversifying crop, livestock and tree species and varieties spatially across the farm or landscape, through crop rotations, or through intercropping. Diversified marketing channels support a diverse agricultural economy.
6. **Habitat networks and land use mosaics:** While sustainable production practices can reduce the ‘footprint’ of farming on wildlife, watersheds, and greenhouse gas balances, long-term ecological health usually requires maintaining some larger areas of natural habitat and connecting them with habitat ‘networks’ within the mosaic of production landscapes. Furthermore, maintaining more of the production area in crops, trees and shrubs that provide year-round vegetative cover of the soil helps to maintain soil fertility and healthy watersheds.
7. **Continual farm monitoring and adaptive management:** To achieve the precise management of inputs, crops, and livestock, farmers must collect and use data on farm heterogeneity (e.g., variations in soil quality or moisture availability) and on changes in farm conditions (e.g., weather, plant health, pest populations).
8. **Local adaptation and experimentation:** Sustainable intensification can rarely be achieved by following generic prescriptions. Rather, farmers must have the knowledge and tools available to enable them to combine and adapt the right practices for their local environment. Similarly, ongoing farmer experimentation—often through farmer groups—enables farmers continually to improve their agriculture and respond to changing conditions. This capacity is especially critical in this era of climate change when much traditional knowledge may become less reliable.

As these principles imply, sustainable intensification may be achieved through a diversity of means, ranging from the application of modern technology, seeds, and machinery to the strategic management of farm ecosystems to improve water and nutrient cycling, pest control, and other critical processes. Rather than choose one method over another, the Greenprint advocates an “all of the above” approach that supports farmers to select and adapt appropriate practices from a large toolbox.

The AGG planning process identified six “best bet” sustainable intensification strategies for the Southern Corridor: conservation agriculture, System of Rice Intensification, precision agriculture, sustainable beef intensification, agroforestry, commercializing drought-resistant crops, and horticulture. Each is explained briefly here and analysed in greater depth in the separate publication on AGG Opportunity Analyses.

“I can assure you the potential is there, but the primary agency for increased agricultural output will be small farmers, and... this needs other supporting systems like road infrastructure and rural electrification”

— Mr. Isaka Mashauri, CEO, Tanseed

Conservation agriculture

Conservation agriculture (CA) is a farming system that includes three core practices: 1) minimizing tillage and other soil disturbance, 2) maintaining permanent soil cover, and 3) diversifying crop rotations. By reducing soil disturbance and improving water and nutrient availability to crops, CA can increase yield, improve drought resistance, and reduce environmental impacts. Profitability often increases as a result of lower input and/or labour costs, combined with higher yields. CA can be used for a wide variety of grain and horticulture crops grown in the corridor including maize, sunflower, beans, peas, sorghum, and vegetables. It is readily adapted to both small- and large-scale farms.

CA is already in use in the Southern Corridor, but not at a large scale. However, worldwide it has been applied on more than 100 million hectares, and CA has already been mainstreamed in diverse contexts including for smallholder agriculture in Zambia and for large commercial grain farms in Brazil, Eastern Europe, and North America. If applied at scale across the Southern Corridor, CA could yield hundreds of thousands of tons of additional grain output, while potentially reducing water use and increasing carbon storage in agricultural soils. (Please see Annex B, Opportunity Analysis #1, for further details and illustrative calculations.) The most important need for scaling-up CA is a concerted extension program emphasizing CA practices through participatory training approaches (e.g., through Farmer Field Schools). The proposed AGG extension strategy is discussed in Chapter 5. In addition, improved access to inputs and CA machinery is needed to enable uptake by both small-scale and large commercial farms. Wherever possible, CA should be paired with integrated pest management (IPM), as suggested by the SRESA, to mitigate the risks of high input use often associated with commercial CA production systems.

System of Rice Intensification and improved rice agronomy

System of Rice Intensification (SRI) is a method for increasing the productivity of irrigated rice by changing the management of plants, soil, water, and nutrients. Compared to conventional rice cultivation, SRI involves intermittent water application (as opposed to continuous flooding), lower plant densities with regular spacing, and reduced use of chemical fertilizers and pesticides. These practices improve soil structure and functioning, facilitate root growth, and ultimately produce more robust rice plants with higher grain yields. SRI is best suited to small-scale rice farming, and can be applied either as an organic system or with judicious application of agrochemicals. The potential for SRI is particularly great in the Corridor given the high risks identified by the SRESA associated with rapid development of irrigation.

SRI benefits have been widely documented, and include a 50-100 per cent (or greater) yield increase, up to 90 per cent reduction in required seed, up to 50 per cent water savings, and substantial gains in profitability.² In addition, SRI rice is generally more drought-resistant and able to resist storm damage because of better root systems and more robust canopies. It is also more resistant to pests and diseases.

² Africare, Oxfam, and WWF. 2010. More rice for people, more water for the planet. WWF-ICRISAT project, Hyderabad, India

SRI has been applied successfully in nearly 50 countries, including neighbouring Kenya, Mozambique, Rwanda, and Zambia.³ Where SRI has received policy and program support, it has scaled up rapidly and contributed greatly to food security and economic development. For instance, after Vietnam's Ministry of Agriculture and Rural Development officially endorsed SRI in 2007, the number of farmers using the practice grew from less than 10,000 to more than one million over the course of four years. In Sichuan Province, China, SRI has expanded to more than 300,000 hectares, yielding an additional 1.66 million tons of paddy rice valued at over US \$300 million.

Within the Corridor, in 2009 Kilombero Plantations Ltd. (KPL) piloted an SRI program for smallholders in the communities surrounding their Mngeta farm. The program provided improved seed and extension services. Within the first year, paddy yields rose from 2-3 tons per hectare to 5-8 tons per hectare. With support from KPL and USAID, the program is expanding to 1,350 new farmers in 2012 and a projected 4,000 total farmers by 2013. Because SRI does not require major capital investment or even access to full-service input supply chains, it is ripe for scaling-up in most rice-growing regions of the Southern Corridor. That said, farmers do need access to equitable rice value chains to enable them to benefit from surplus production that is likely to result from SRI adoption. In Dodoma, SRI technology and improved value chains are being implemented through the USAID-supported Nafaka program. Additional priorities for scaling up SRI are identified in the AGG Opportunity Analysis publication.

Sustainable intensification of beef production

The potential for sustainable intensification of livestock production in the Southern Corridor is enormous. Tanzania has one of the largest livestock herds in Africa, occupying vast areas of land, in increasing conflict with other land uses. Yet, more than 90 per cent of the nation's cattle, sheep, and goats are unimproved breeds that provide low yields and inferior meat quality; and limited value addition of animal products further diminishes the livestock sector's economic output. Sustainable intensification of livestock involves the production of more meat of higher quality, with less total input of land and water. These outcomes result from better range management and restoration of degraded lands, appropriate stocking rates, improved livestock breeds, improved livestock health, supplementary feeding of grain or fodder crops at critical lifecycle stages, and efficient, humane and environmentally safe slaughter and processing facilities.

In the Southern Corridor, sustainable livestock intensification is feasible for beef, dairy, and small livestock in the context of large ranches, pastoralism, and smallholder mixed farming. Large cattle ranches with integrated production and processing operations offer a best-bet opportunity to sustainably intensify beef production, with synergistic benefits for smallholders and pastoralists. Currently, the Corridor contains four large, underperforming ranches owned by the National Ranching Company (NARCO). Total current stocking on these ranches is about 16,000 head of cattle, but carrying capacity with proper range management, rotation, and animal management is up to 50,000 head for grassfed production, or several times more for feedlot-based systems. These ranches provide near-term opportunities for sustainable intensification that could simultaneously maintain or enhance range conditions and provide market hubs for supporting small-scale livestock producers.

Agroforestry for food security, fodder and income generation

Agroforestry involves the integration of trees into cropping and livestock systems to provide multiple benefits including fruit, nuts, fodder, fuelwood, and fertilizer from nitrogen-fixing trees. Many forms of agroforestry are already in use in the corridor, and could be used much more widely to help farmers diversify their income, increase resilience and guard against crop failures, and increase carbon sequestration throughout the region. Tree species that compete minimally with, or benefit, understory crops can be grown as intercropped; others can be grown on

3 For more information on these experiences, please see <http://sri.ciifad.cornell.edu/countries/index.html>.

boundaries or in small woodlots or orchards. One opportunity with widespread applicability in the Corridor is fruit tree agroforestry. Currently, fruit trees exist on many small farms in the Corridor and provide a food security 'safety net' with particular importance for women and children, who typically participate less in the cash economy. Fruit tree agroforestry could be readily intensified through sharing of new species and varieties, community nursery projects, and training in establishment, management and marketing of fruit crops. Fodder trees and shrubs can be used for feeding livestock, and on-farm trees can be pruned as a sustainable source of fuelwood.

Commercial production and processing of drought-resistant crops

Climate change in the Southern Corridor is likely to have significant impacts on agricultural crops and production systems. In fact, farmers in the Corridor are already beginning to shift away from maize systems to more drought-resistant crops as a result of changing rainfall patterns. Not only will this affect planting strategies used by farmers, processing facilities will need to introduce processing technologies for new crops. Currently, farmers are turning to sunflower and sesame (simsim) as promising drought-resistant crops to replace maize, a regional staple. Sunflower is already grown and processed for oil in Iringa region by the Southern Highlands Agricultural Development Company (SHADECO Ltd.). The seedcake produced as a byproduct of processing can also be used as a fuel source or high-quality fodder. However, seed varieties currently available to farmers yield low amounts of oil and processing technologies need to improve in efficiency to be able to scale up production. Similarly, processing facilities need to expand to processing multiple oil seeds, in order to include sesame. The Southern Corridor offers numerous opportunities for innovative processing and marketing. SAB Miller, nearby in Mozambique, is an example of innovative processing, using locally sourced cassava to brew its Impala beer.

High-value horticulture and livestock products in mixed smallholder farming systems

Demand for horticultural products for domestic consumption is increasing due to changes in dietary preference. This trend toward nutritional diversity is a positive one, and creates new market opportunities for vegetable producers. Because of perishability concerns, a distributed network of horticulture producers is often most efficient. Horticulture crops tend to yield much higher revenues per unit land area or unit of irrigation water than grain crops. They also benefit strongly from on-farm nutrient sources such as compost, small livestock manure, or residues from biogas digesters. Horticulture is therefore often a synergistic part of a mixed farming system. It is also an important side crop that can help maintain good nutrition for smallholders who become outgrowers of a dominant food or non-food cash crop.

Similarly, integrated crop-livestock systems can take advantage of resources that most smallholders have on-farm to boost both crop and livestock production through nutrient recycling. Closing the loop for efficient nutrient cycling allows farmers to intensify production without purchasing additional inputs or using more land. In these systems, crops function as food, fodder and mulch while livestock produce meat, dairy products and fertilizer. Another option, for farms with access to ponds and small dams, is integrated livestock-aquaculture systems, where livestock waste serves as nutrient-rich fish food. Integrating farm systems often establishes synergistic relationships which will generate benefits to productivity, income and household nutrition.

Sustainable input management

The Blueprint includes many strategies that can support sustainable intensification. For example, weather insurance for smallholders—also known as microinsurance—could be a tool for reducing the risk profile of smallholder farmers, allowing them to make investments in sustainable technologies, new crop varieties and fertilizers. The nucleus farms and small and medium-sized agribusinesses identified in the Blueprint serve as primary sources for farm inputs, while for farmers unaffiliated with nucleus farms, producer associations will play a key role. AGG encompasses additional input strategies, including precision agriculture, rainwater harvesting, irrigation efficiency, commercial bio-inputs, and high-quality seed for more diversified production systems.

Precision agriculture

Precision agriculture uses a suite of tools and technologies to apply just the right amount of agricultural inputs (e.g., water, fertilizer, and pesticide) to ensure good crop health, improve input use efficiency, and reduce waste and pollution. Farmers conduct real-time monitoring of variation in water availability, nutrient availability, and pest problems across their fields to ensure that inputs are applied in the right place at the right time. The term precision agriculture usually refers to large farms using modern information technologies such as laser levelling for field preparation, GIS yield monitoring and mapping, and GPS-guided farm machinery.⁴ However, the basic principles of precision agriculture can be equally well applied using simple evaluation protocols (such as leaf colour charts) and technologies (such as drip irrigation) on small farms.

Precision agriculture has been widely adopted on large commercial farms with adequate capital to invest in the requisite machinery and technology. For instance, as of 2006, 45 per cent of land planted to soy in the United States used GIS yield monitoring technology while 35 per cent used variable rate input application technology.⁵ When it is applied on commercial farms that already have high yields, precision agriculture does not tend to increase yield significantly, but it does reduce input use, thereby lowering farmer cost, boosting profitability, and reducing pollution.⁶ When precision techniques are applied on smallholder farms using traditional, unimproved practices, significant yield gains may be expected due to improved plant health and the elimination of key water and nutrient deficiencies, with affordable levels of inputs. Additional information may be found in the AGG Opportunity Analysis document.

As the incremental cost of precision agriculture equipment falls, the economic rationale for investing in the technology improves. In the Southern Corridor, as new large-scale farms come online, policies and incentives should be put in place to encourage the adoption of precision agriculture technologies that reduce water use, greenhouse gas emissions and pollution. Such policies include easing any existing restrictions on import of machinery needed for sustainable production, charging appropriate user fees for water, and instituting AGG guidelines for clean, efficient agriculture (see Investment Guidelines in Chapter 5). The Catalytic Fund could be a source of finance to help companies overcome the initial investment hurdle of acquiring PA machinery and technology that would yield long-term dividends in terms of yield, profitability, and reduced environmental impact.

Rain water harvesting

Improved water management is widely acknowledged as being critical to the future of Tanzania's agriculture sector, particularly in light of projected changes in the climate. In the Southern Corridor, as in most of sub-Saharan Africa, the vast majority of crops are produced in rain-fed systems. The annual total rainfall in much of the Corridor is great enough to support a wide range of crops under rainfed conditions. However, the seasonal variability of the water supply—which is expected to increase with climate change—presents a major challenge for farmers. Currently, it is estimated that nearly 70 per cent of rainfall is lost to surface runoff.

Rainwater harvesting (RWH) provides a range of solutions for capturing, storing and redirecting this runoff for agriculture, livestock and domestic use. Besides increasing yields in rain-fed systems, RWH also mitigates against crop failure during dry periods. The most common methods of RWH include contour farming and ridging, the

⁴ Geographic Information Systems (GIS) are software platforms for organizing and analyzing spatial data. Geographic Positioning Systems (GPS) use mobile devices used to record the user's position on Earth. GPS-driven machinery is able to follow or apply inputs precisely according to a pre-programmed location-based protocol.

⁵ Ebel, R., and D. Schimmelpfennig. 2011. The Information age and adoption of precision agriculture. Economic Information Bulletin Number 80. United States Department of Agriculture.

⁶ Based on the review conducted by Milder et al. 2012. Moving beyond ideology to close yield gaps and "nature gaps" in 21st century agriculture. Report to the Bill & Melinda Gates Foundation.

use of pits and bunds in various configurations, and positioning of fields to capture water sheeting off a hillside. The method employed depends on the crop, soil, labour and capital available to the farmer. In many cases, RWH is supplemented by storage units such as dams, pans or larger reservoirs, and re-vegetation of degraded lands to slow water flow and improve infiltration. Such storage units allow farmers to redistribute erratic rainfall evenly throughout the growing season or even extend the growing season into drier parts of the year.

RWH has been used successfully to improve yields in semi-arid watersheds in northern Tanzania. In the Makanya watershed, for instance, farmers implementing RWH saw yield increases of more than 1 ton per hectare. Under optimal conditions, RWH can increase maize yields by a factor of four; however, when labour inputs for RWH are considered, the short-term returns on labour are relatively low, except for high-value crops such as onions and tomatoes, which demonstrate both higher yields and higher returns on labour from RWH.

Irrigation efficiency and governance

Irrigated agriculture in the Corridor supports some of the most important commercial crops, including rice and sugarcane. Many irrigation schemes exist throughout the Corridor for smallholders, block and contract farmers, and large commercial farms. The majority are traditional irrigation systems that divert water from streams onto cropland. These systems, while inexpensive, tend to be highly inefficient. In most cases, only 20-60 per cent of the water diverted from the stream will remain in the field. Old systems may be even less efficient due to leaks in pipes and culverts. In practice, governance of irrigation in Tanzania is quite weak, but there is potential to improve this situation first, by performing comprehensive water assessments throughout the Corridor, as recommended by the SRESA, and secondly, through participatory water governance systems. Irrigation and water management are highlighted as top priorities in the ASDS, ASDP, and NAPA. Investment in improved water management ranges from simple changes that farmers can make themselves with no capital requirements, to costly infrastructure with longer payback periods.

Commercial bio-inputs

Opportunities are likely to grow for small and medium size enterprises in Tanzania to form and partner with companies in India, Brazil and elsewhere which are advancing technologies for the manufacture of bio-inputs for nutrient management, bio-pesticides, bio-herbicides and bio-fungicides principally from agricultural wastes. Experience with some of these products in India indicates that smallholder farmers can save 20 per cent on the cost of inputs over agro-chemical products while increasing yields by 20 per cent and improving soil quality. Companies that are developing and producing agricultural bio-inputs from agricultural wastes, especially from the sugar industry, are gaining experience with selling to farmers in Uganda, Zambia, and elsewhere in Africa with a view to expansion through partnerships with local enterprises.

Biochar, a type of charcoal that is used as a soil amendment to increase soil fertility was inspired by discovery of the productive “dark earth” soils of the Amazon Basin and West Africa, which were amended with biochar thousands of years ago to support agriculture. Scientists are now investigating the role of biochar in supporting sustainable agriculture and carbon sequestration. Because it helps increase plant nutrient availability in low-fertility soil, biochar is considered a promising amendment option for nutrient-depleted soils found throughout much of sub-Saharan Africa. In addition, because biochar is a stable form of carbon, it has the potential to sequester soil carbon for hundreds to thousands of years, potentially making it a major contributor to climate change mitigation. Pyrolysis, the process used to make biochar from wood, results in additional energy products, such as bio-oil and syngas. Because of its multiple applications for soil improvement, waste management, energy production and climate change mitigation, biochar should be further explored as a promising innovation for the Corridor.

High-quality diversified seed and germplasm

The availability of high-quality, disease-free seed is critical for successful agriculture. SAGCOT partners are already working to improve multiplication and distribution systems for commercial seed of major annual crops with selected traits of value to farmers, traders and food processors. For example, AGRA extension programs help smallholder farmers access improved seed varieties through subsidies and grants to agribusiness partners, and has programs for training master's level students in plant breeding. Agriculture Green Growth strategies will supplement this strategy to enable farmer access to a greater diversity of crop and tree species, to increase resilience in the face of climate and market variability and shocks and reduce vulnerability to pests and disease. For example, programs can be expanded to select, produce and disseminate seed and germplasm from high-performing tree and shrub species and provenances for use in agroforestry systems and farm forestry, building on collaborative work with the World Agroforestry Centre and others. Existing programs can shift the balance from direct provision of subsidies and inputs to exploring opportunities for strengthening local seed suppliers and training smallholders through participatory plant breeding programs. Farmers' own seed networks can be strengthened to include both commercially-improved seed and farmer-selected seed for diverse agroecological niches and climatic conditions.

Forest, energy and eco-enterprises

As emphasized throughout the Greenprint, natural resources such as water and forests underlie the Southern Corridor's long-term wellbeing and prosperity, particularly for agricultural development. Energy is an additional resource that, for the foreseeable future, will be derived mainly from biomass sources; thus, any energy strategy must by necessity interwoven with issues of land use, deforestation, and biomass management. Historically, forests and water tended to be exploited by the private sector with little view toward long-term sustainability; protection for such resources, to the extent it existed, came from the public sector. In contrast to this approach, a central premise of Green Growth that forests, water, and other critical resources are 'investable assets' that are the focus of private sector investment. Such investment seeks to maintain and increase the productive capacity of the resource, thereby supporting off-take (e.g., forest harvest) that can be sustained indefinitely—as opposed to one-time exploitation. Private investment is not a substitute for well-designed and managed protected areas and regulatory and governance systems. But it is essential for improving the management of the two-thirds of the Corridor that is not designated as a conservation management area.

Sustainable commercial and community forestry

Planned agricultural and infrastructure investments and income growth will further accelerate a growing commercial demand for forest products in the SAGCOT region. A recent study on Tanzania estimated the annual value of the charcoal business to be US\$650 million and growing⁷ while the timber value has surpassed US\$700 million.⁸ This demand could either threaten the region's rich forest resources, as is the case today, or become a positive driver of economic growth and poverty reduction. The future trajectory will hinge on whether commercial and community forestry enterprises can be scaled up.

Fortunately, in Tanzania the policy environment for private investment in plantation forestry has improved and has led to the decentralization of control over forest resource. The National Forest Policy approved in 1998 and the Forest Act of 2002 have strengthened the role of the private sector and Community-Based Forest initiatives in the management of forests. While the policy allows for the potential for a scaling up of sustainable private community-led forestry, a lack of investment, market information, infrastructure, and access to modern technologies and tools

7 http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2012/11/01/000356161_20121101023544/Rendered/PDF/730260REPLACEMENT0Plan06014012web.pdf

8 <http://www.fao.org/forestry/33812-0a6dfa76c5928641d46b18f74b3be5596.pdf>

is hindering the industry's development.⁹ Therefore, there is considerable opportunity for investment, particularly for operations to work with small-scale foresters, and to develop processing facilities.

Pilot investments can help to identify effective business arrangements and provide start-up financing for innovative ideas. Increased investment in technology and market development will improve efficiency and profitability. For example, the Gatsby Foundation¹⁰ has partnered with the Tanzania Forestry Research Institute (TAFORI), in addition to other partners in Kenya and Uganda, to develop private small-scale tree nurseries, and to support research on tree biotechnology, training, and market development.

Opportunities for Tanzania-based processing are also growing. Small-scale foresters would value collaboration with socially and environmentally responsible forest product companies to improve commercial quality and business management. Sao Hill Industries in southern Tanzania is an example of company with forest plantations and a processing facility striving to align with sustainable operating practices. A subsidiary of the forest product and carbon offset company Green Resources Ltd., Sao Hill mill is also utilizing co-generation (see section on biomass energy) to power its facility and is exploring methods (including short rotation community forestry) to sequester more carbon on their lands.

Payment for ecosystem services

In Tanzania and throughout the world, the people and communities who manage important natural resources are being compensated for their efforts through programs of payment for ecosystem services (PES). PES is a market-based approach in which beneficiaries of ecosystem services—such as water users and conservationists—pay the providers of these services to sustain healthy ecosystems and thereby ensure continued service flows. In rural landscapes, PES approaches have most commonly been applied for four services: 1) maintaining clean water, 2) regulating or enhancing water supply or flow, 3) sequestering carbon in soils or plants or avoiding greenhouse emissions, and 4) conserving plant and animal species, or the habitats they use. Within the Corridor, for instance, a pilot PES scheme in the Uluguru Mountains compensated farmers to plant trees, install terraces, and conduct other practices to reduce siltation into a tributary supplying water to Dar es Salaam. In other parts of the Corridor, a series of REDD+ pilot projects are currently being implemented to provide rural communities with payment for 'carbon credits' generated by reducing deforestation and more effectively managing community forests. An additional example—while not strictly a PES project—is illustrative of the 'business case' for PES for commercial farms. In Kilombero Cluster, a major rice estate (Kilombero Plantations, Ltd.) has enlisted (and is supporting) a Tanzanian NGO to assist upstream communities in more effectively managing forests, both for income generation and for ensuring clean, abundant supplies of irrigation water.

Because PES is voluntary on the part of both the buyer and seller of ecosystem services, it is typically a win-win transaction in which healthy ecosystems are conserved while the payment recipient receives funds that at least fully compensate any foregone revenue associated with the conservation activities. These above examples illustrate three prime rationales for scaling-up PES in the Corridor:

1. PES can be the most cost-effective way of protecting critical 'public goods' such as reliable water supplies for cities or hydroelectric dams.
2. PES is a principal mechanism by which farmers and rural communities can participate in global carbon markets, receiving incentives for managing carbon-rich landscapes.

9 Ngaga, Y.M. 2011. Forest Plantations and Woodlots in Tanzania. Nairobi: African Forest Forum.

10 <http://www.gatsby.org.uk/Africa/Projects/East-African-Forestry-Sector.aspx>

3. PES can help a range of companies—from farm estates to bottling plants—ensure reliable future supplies of key production inputs, thereby reducing risk in a cost-effective way.

As users of ecosystem services consider the above rationale, PES may be adopted spontaneously in areas of the Corridor where it is feasible and economically efficient. SAGCOT stakeholders (particularly conservation organisations) can also play a role in identifying places where PES is likely to be especially worthwhile, and connecting the parties to organisations that can set up PES schemes. Additionally, the GoT, through its climate change planning work, can further develop REDD+ projects and earn carbon credits through the significant amount of avoided deforestation anticipated under the Greenprint strategy (see Chapter 7).

Biogas energy production

Modern energy services are largely provided from a central grid for electricity or piped natural gas. For most rural communities in southern Tanzania, however, centralized power is not likely to become available, even under the ambitious SAGCOT goals. With likely price increases for fossil fuels over the next few decades, even transportable fuels such as diesel and kerosene will become increasingly costly. An alternative to producing power centrally and building large-scale transmission infrastructure to deliver it is to produce energy locally and distribute it through small-scale networks. This approach is not only cleaner; it may also be more reliable to ensure that power is available when it is needed for purposes such as pumping irrigation water and maintaining cold storage for food distribution networks. At a national level, development of alternative clean energy sources to compensate for future decreases in hydroelectric potential is identified as a priority area in Tanzania's National Adaptation Programme of Action (NAPA).

One particularly suitable fuel for the Southern Corridor is biogas. Biogas can be used as a fuel for any heating purpose, such as cooking. It can also be used in anaerobic digesters where it is typically used in a gas engine to convert the energy in the gas into electricity and heat. Biogas can be compressed, much like natural gas, and used to power motor vehicles. In Tanzania biogas is produced mainly through the decomposition of organic waste, such as manure or agricultural residues in a biodigester. Among other advantages, biogas may be generated from multiple and variable fuel sources, may be stored until it is needed, is fully scalable from household to industrial applications, and generally produces no net greenhouse gases. In fact, in some contexts, biogas systems result in net emissions reductions.

There are already many businesses in the Southern Corridor involved in biogas production at the farm and household levels. In addition, a number of companies that build and distribute biogas systems are interested in conducting or scaling-up business in the Corridor. Below are a few examples that illustrate the types of innovations—and the scale of possible impacts—that are possible.

One company, Simgas, sells biodigesters that are mass-produced in Tanzania, portable and scalable. For household application, Simgas provides loan financing for buyers payable over the course of 18 to 36 months. The company estimates that microfinance investment in the range of \$80 million to \$190 million, deployed through a revolving finance scheme over a 20 year period, could enable 200,000-300,000 rural households in Tanzania to acquire a Simgas system. At this scale of uptake, the participating households would realize a total energy cost savings of \$1.5 billion over 20 years, while preventing the harvest of 25 million tons of wood (the equivalent of about 675,000 hectares of standing forest) and decreasing carbon emissions by about 30 million tons of CO₂-equivalent.

Conventional biogas technology has impurities that limit the scale of power. An international company, Emergence BioEnergy, Inc, has developed a franchise package known as the EBI Utility Station or EBUS, that an entrepreneur owns and operates to provide reliable energy to rural consumers. The EBUS uses cow manure to produce energy in a micro-combined-heat-and-power (micro-CHP) unit. A ten-cow operation can generate one

kilowatt on a continuous basis. The EBUS adopts a ‘waste-nothing’ approach generating six streams of revenues that are intended to triple the overall return of small dairy farms. These six revenues—which include electricity, milk, refrigeration, fertilizer, methane credits, and electrified commercial space—leverage natural synergies in both farm production and product marketing. The company also offers a village-sized EBUS model sized at 4 kilowatts (40 cows) that is large enough to power irrigation pumps and small agro-processing enterprises or refrigeration for dairy facilities (cooling 250 litres of milk). Where it is being tested in Bangladesh, the investment cost is \$10,000, with a payback on dairy farms in only 18 months.

The state-owned utility TANESCO, which is responsible for the central electricity grid, has utilized several biomass energy production processes. It has also established contracts with power plants to purchase electricity produced from biomass, facilitating the development of rural grid extensions and independent ‘mini-grids’ that can utilize biomass and will serve much of the population currently without electricity. For example, Ngombeni Power is contracting with TANESCO and using the process of gasification with an agricultural residue, coconut husks, to generate electricity. Similarly, SAO Hill Energy is selling the energy produced through co-generation back to TANESCO. Much of the support for these efforts to build Tanzania’s renewable energy portfolio is through the Climate Investment Funds’ Scaling up Renewable Energy Programme (SREP) and the Tanzania Energy Development and Access Expansion Project (TEDAP). This state of policy, institution and infrastructure development presents an ideal opening for additional private investment.

Finance is currently a key missing ingredient that limits uptake of bioenergy systems. However, because of its short payback period, low risk, and compelling co-benefits for poverty alleviation, climate change mitigation, and ecosystem conservation, there is the potential for many commercial as well as social investors to be attracted to this space. For instance, funding for biogas digesters and village/enterprise-level bioenergy may be available from the international ‘Sustainable Energy for All’ initiative that was launched in June 2012 at the United Nations Conference on Sustainable Development (Rio+20). In addition, USAID is providing \$300,000–\$1,000,000 grants through its ‘Powering Agriculture’ initiative, which SAGCOT partners could potentially access to test innovative energy solutions.

Greening the value chain

Supporting whole value chains and value added activities is crucial for guaranteeing that the benefits of Cluster development accrue broadly to the population. Under Agriculture Green Growth, support for entire value chains and promoting value addition become even more important to process, transport and market the substantial additional production projected to come from unaffiliated smallholders across the Corridor. The Blueprint already makes many recommendations for capturing added value in the Clusters through processing facilities available to smallholders via outgrower schemes, smallholder producer associations which give smallholders greater power in the market, and regional storage and processing facilities that decrease the distance of unaffiliated smallholders to end markets. AGG offers further opportunities to ‘green’ the value chain for products from larger-scale producers and smallholders alike.

Local agro-processing

Small and medium Tanzanian businesses can bridge the gap between smallholders and larger markets, stimulating growth while encouraging sustainable production practices that improve product quality along entire value chains. The captured value can be reinvested in local development. Processing facilities can use technologies that are water and energy-efficient and minimize wastes and pollutants. The Southern Highlands Agricultural Development Company Limited (SHADECO Ltd.), a sunflower processor in Iringa Region, is one such business that supports sustainable intensification of sunflower by processing seeds for oil and seed cakes sold. By offering value-added services, the company supports smallholders who are shifting to sunflower under changing climatic conditions and driving improved seed production in order to meet the quality standards for their own markets.

Differentiated markets and eco-certification

As noted in Chapter 3, agricultural markets are beginning to place value not just on the quality of agricultural products but also on the environmental and social performance of production and processing. Many farmers and food processors in the Southern Corridor adhere to high standards of quality and sustainability, but to be able to benefit financially from these practices, they need a way to distinguish their superior products in the marketplace. This is the role of differentiated markets and eco-certification—including organic production standards; agricultural product standards for internationally traded goods (e.g., GAP standards); requirements of exporting bodies; private sector standards, such as sourcing guidelines of international food companies; and third-party eco-standards, such as Fairtrade, Rainforest Alliance, and Forest Stewardship Council. Compliance with such standards can offer a significant business opportunity for producers in the Southern Corridor by: 1) enabling them to receive price premiums for their products; 2) increasing access to foreign markets or niche markets; and 3) ensuring more stable or guaranteed demand for their products.

Voluntary agricultural eco-standards have grown substantially in Tanzania in the past decade, and producers are using this opportunity to differentiate their products by adhering to standards such as organic and Rainforest Alliance. For example, TanCert was established in 2003 as a national certification body for organics, and now in Tanzania there are nearly 90,000 certified organic producers, managing about 62,000 hectares, or 0.2 per cent of the country's agricultural land. Organic production in Tanzania increased more than five-fold from 2001 to 2009, yet the sector remains relatively small compared to neighbouring countries. The Corridor has more than 35,000 hectares of high-value horticulture, coffee, tea, cocoa and other crops currently under organic production, engaging more than 41,000 farmers, mostly through outgrower schemes, but there are only two organic food processors in the country: Dubaga in Iringa and Chemi in Dar es Salaam.

Rainforest Alliance (RA) provides a framework for eco-certification that allows estates and smallholders to access better markets for their products. In the corridor, more than 50,000 smallholders are certified in coffee, tea and cocoa. One particularly successful case of RA certification in the corridor is the Unilever tea estates located in the Eastern Arc Mountains. Commitments have been made to scale up these RA certification efforts significantly. Rainforest Alliance certification has recently been granted for 20,000 cocoa farmers in Kyela district and thousands of hectares of Unilever tea estates in Mufindi district. These certifications have helped to conserve biodiversity, protect critical water supplies, sustain a woodfuel resource for tea drying, and increase income for small-scale farmers and farm workers.

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Eco-certification and market differentiation holds significant potential for the Southern Corridor, and is among the best ways to link small-scale farmers to lucrative export markets for key crops. The most promising opportunities are for fruits, vegetables, tea, coffee and cocoa. In the longer term, differentiation of staple grains based on quality and sustainability is possible, and has succeeded in neighbouring Zambia and elsewhere. There was particular interest during the AGG Leaders Workshop in pursuing eco-standards for rice. The AGG Opportunity Analysis document provides more information.

Off-grid solar energy

Off-grid solar energy could be developed for use in agriculture as well as other rural economic activities. The power generated on Tanzania's central grid is relatively minimal, unreliable, and often does not reach rural communities (only 10 per cent of the country's population, and 2 per cent of rural households, have access to electricity from the national power company¹¹). Moreover, the expansion of a national grid will likely progress too slowly to meet rapidly growing energy needs during the development of the corridor. Right now, the majority of energy is produced using biomass, but Tanzania has significant potential for solar energy conversion, adequate for small-scale use photovoltaic technologies.¹²

The Government of Tanzania has an Energy Policy in place, which identifies personal solar home and business systems as key contributors to rural electrification. A World Bank funded project, the Tanzania Energy Development and Access Project (TEDAP), is focused on providing renewable energy to rural enterprises and facilities that can distribute electricity to households (i.e. establishment of 'mini-grids'), providing grants and other financial and technical assistance to establish off-grid solar power systems (among other energy technologies). In addition, a project being implemented by Camco,¹³ through the Rural Energy Agency, is attempting to reduce the costs of establishing off-grid solar power and engaging the private sector in the solar photovoltaics market. This project has already benefited tea, coffee, and cashew farmers in Southern Tanzania, through subsidies and initial assistance for home panels. Given solar power's potential, the recent expansion of solar home systems, and the limitations of the current central grid, there could be substantial business opportunities for sales, installation, and services related to solar energy.

Greening infrastructure investments

The road, rail, energy, storage, human settlement and other infrastructure developments to be implemented in SAGCOT to support agricultural development will have major impacts on the environment. The construction phase can involve extensive earth-moving and habitat disruption, sedimentation and disruption of waterways and release of toxic chemicals into air, water and land, if not carefully planned and implemented. The choice of spatial layout, materials used and the energy efficiency of systems will have long-term consequences for the Corridor. It is essential that environmentally responsible designs and processes be used. At this early point in the process, stakeholders in the Corridor can make the choice to go beyond minimum environmental and social standards, and embrace and adapt the latest standards in 'green infrastructure', including the creative use of green spaces and farmed areas to provide water quality, waste processing and other services essential. Benefits can often include large operational cost savings over the life of the infrastructure, and avoidance of costs to other businesses and communities.

11 Bakanga, G.E. 2011. Diffusion Policies for Solar Photovoltaic Application in Tanzania. Dar es Salaam: Government of Tanzania. http://www.academia.edu/1138330/DIFFUSION_POLICIES_FOR_SOLAR_PHOTOVOLTAIC_APPLICATION_IN_TANZANIA

12 Hammer, L. 2011. Distribution of Wind and Solar Energy Resources in Tanzania and Mozambique. Gothenburg: Chalmers University of Technology. http://publications.lib.chalmers.se/records/fulltext/local_150046.pdf

13 Camco Clean Energy. 2013. Solar Electricity in Tanzania. <http://www.camcocleanenergy.com/1287653543176.html>



5. Creating fertile ground for AGG

While there are numerous ripe opportunities for agriculture-led Green Growth throughout the corridor, as highlighted in the previous chapter, scaling up such profitable, sustainable activities from isolated examples to mainstream practice requires creating a fertile environment. Investment and innovation in AGG must be widely known, economically attractive and affirmatively supported by government and civil society. This enabling environment includes public policies, public infrastructure investment, regulation, incentive structures, technical assistance and other components.

At present the enabling environment in the Southern Corridor includes many positive aspects, including sound policies and procedures in several of the key sectors; government commitments to investment in agriculture through Kilimo Kwanza, the ASDP, and CAADP; official commitments to participatory planning and priority setting, including at the local level; and a number of strong institutions that support sustainable land management (see Box 2-2). However, there are several important gaps and barriers. The Blueprint identified a number of needed improvements to support the SAGCOT strategy, including regularization of agricultural taxation, tariffs, and transportation levies; development of principles for agricultural trade and land acquisition that do not disadvantage smallholder farmers or domestic agriculture; strategically deploying government and development partner resources to catalyse private sector investment; and building institutional capacity to manage and monitor SAGCOT activities.

To achieve AGG at scale, several other improvements will also be needed (summarized in Table 5-1):

- Strengthened land and water planning and allocation;
- Support for local organisations and leaders to mobilize action;
- Agricultural extension for AGG; and
- Collaborative approaches to SAGCOT Cluster development.

As shown in Figure 5-1, these enabling activities led by government and civil society, but with strong business involvement, complement the private sector-led investment generation strategies that will be described in chapter 6, to generate Agriculture Green Growth.

Strengthened land and water planning and allocation

Land allocation, land use planning, and land tenure in Tanzania are complex issues with strong historical, cultural, and political dimensions that have long resisted simple solutions. Yet, Green Growth—indeed, any far-reaching economic growth program—cannot be realized without efforts to plan and allocate land more rationally, more equitably, and more transparently. Water planning and allocation issues have not generated as much public attention as land issues, but are also critical, and likely to become more so as population growth and economic development increase water demand and shift Tanzania into the realm of a water-scarce nation. Three inter-related land and water issues and needs must be addressed: spatial planning, identification of land for investment and community security.

Land and water resource spatial planning

Land and water resource planning currently takes place at the village, district, regional, and national levels, but the level of capacity to conduct planning at each of these levels is inadequate. For instance, the Land Use

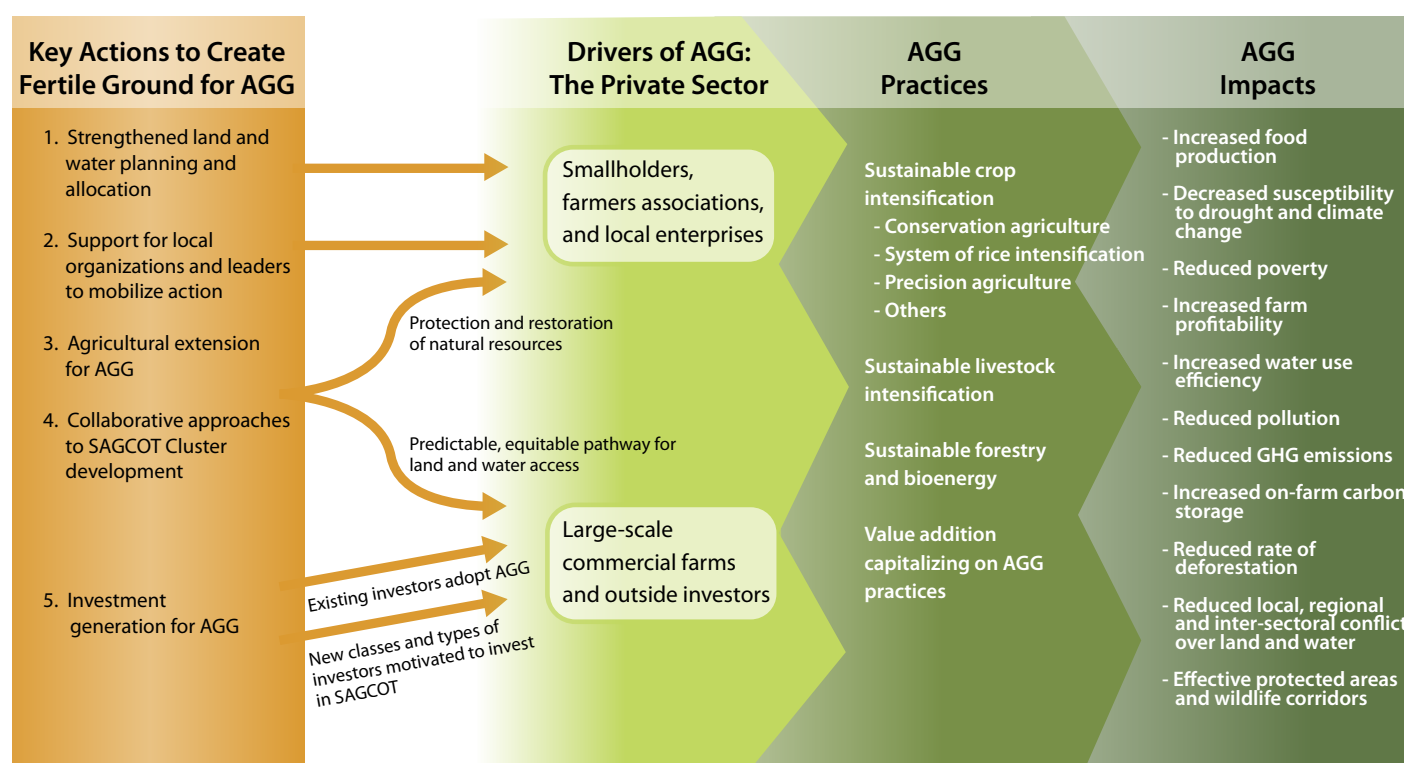


Figure 5-1. Impact pathways for achieving Agriculture Green Growth.

The figure indicates the ways in which government and civil society action can support the private sector to implement Agriculture Green Growth. These complement other enabling activities noted in the Blueprint related to trade, taxation, infrastructure, and titling.

Planning Commission has developed a participatory process and set of guidelines for creating village land-use plans (VLUPs), but such plans have been developed for fewer than 1,000 of Tanzania's 11,000 or so villages. Sectoral land use planning (for agriculture, forestry, watersheds, wildlife, et al.) is also conducted through various ministries under multiple statutory authorities, but such plans are rarely integrated or harmonized to a meaningful degree. In the water sector, the National Water Policy of 2002 provides for comprehensive, multi-sectoral water planning and allocation at the basin level, but for various reasons this approach has not yet been fully implemented. To ensure that agricultural development does not disrupt wildlife corridors or watershed functions, greater harmonization is essential.

Identification of land for investment

Access to land for production has been a significant bottleneck for private sector investment in the Southern Corridor. At present, 60 per cent of all land in the Corridor is classified as village land, 2 per cent general land and the rest is held aside for wildlife and water conservation. New village and district planning processes and a functioning land bank will ensure a predictable, efficient process for acquiring suitable land for agricultural investment and maintaining clear, enforceable rights and obligations. SAGCOT will work with other Tanzanian institutions such as the Tanzanian Investment Centre to guide investors to locations where strong land use plans are already in place. Even when land can be accessed, lengthy and costly administrative processes have sometimes delayed projects if not halted them altogether.

The Government of Tanzania has defined a clear process now and is providing useful guidance for businesses in negotiating the process. This involves six steps: Participatory Village Land Use Plans, identifying available land not needed for crop, fuel, pasture woodland or wildlife for the next 10 years; a detailed land survey; transfer to the category of General Land; provision of a derivative title or lease or equity; and final transaction. Once

Table 5-1. Creating fertile ground for Agriculture Green Growth in the Southern Corridor

Priority for creating fertile ground	Current limitation or need	Key groups to engage in creating fertile ground
Strengthened land and water planning and allocation	Despite official commitments to integrated participatory planning, land and water planning processes are generally sparsely implemented, fragmentary, subject to confusion and weakly linked to implementation.	• Tanzanian authorities that govern land • District land-use officers and other personnel • Local communities • Water basin authorities • Academic and civil society organisations with technical planning capabilities • Various coordinating entities
Support for local organisations to mobilize action	Tanzania has a strong tradition of local organisations and collective action, but these remain a largely untapped resource for catalyzing AGG. New forms of financial and technical support can unleash significant new investment and innovation from the smallholder sector.	• Farmers associations • Local NGOs • Savings and credit groups and other cooperatives • Local political leaders
Agricultural extension	Need for a much larger extension force, greater focus on field-based and participatory methods, and new training in agroecology, natural resource management and ecosystem service conservation.	• Government extension personnel and decision-makers • Local and international NGOs • National and regional universities and training and resource centres • CBOs
Collaborative Cluster development	Tanzania has a tradition of village level land use planning, but little capacity for community-engaged planning at larger scales. Cluster level AGG will be enhanced by improving capacities in cross-sectoral, collaborative approaches to landscape planning and management including use of spatial tools for planning AGG innovations.	• Leaders in diverse public, private and civic sector organisations with ideas, networks, experience and motivation to advance AGG approaches • Village and regional land use planners • Donors who support sustainable agriculture, climate change adaptation, conservation, livelihood security and community-engaged development and research

the village Land Use plans are completed, land can potentially be provided in 6-12 months. But there is still a backlog of work, as only 20 per cent of the Village Land Use Plans have been completed and many of those are in areas with large conservation reserves.

Community security

At present, most small-scale land users and communities have relatively little security in their access to land and water. In principle, VLUPs are the basis for defining land tenure regimes that provide appropriate levels of control and security for individuals and communities. In practice, however, only a minority of VLUPs have been implemented through the issuance of titles. Furthermore, even where they are in place, planning designations and land titles are frequently not enforced, for both legitimate and illegitimate reasons. Even where VLUPs are in force, there have been instances where plans have been coercively amended when investors

expressed interest in lands within a village. Additionally, the President holds the power of compulsory acquisition, under which he may re-designate the use of land to advance the national interest.

The Blueprint recognizes the importance of these issues and recommends new land use allocation efforts across multiple scales. For that reason, the government is encouraging nucleus-outgrower arrangements that will engage outgrowers in training, facilitate access to improved technology and inputs, and strengthen positive relationships between investors and communities. The Ministry of Lands' process for leasing land relies on participatory planning to identify areas for investment and has safeguards in place to protect community rights and interests, allow for rapid investment, and link communities and investors through profit sharing mechanisms that incentivize mutual support and promote long-term success for investments.

Mobilizing action through local organisations and local leadership

Farmer organisations and supportive civil society organisations (CSOs) can play many valuable roles in advancing AGG in the Corridor. Farmer groups and producer associations can help to organize input supplies and post-harvest value addition and sale. Many have saving and credit cooperative societies (SACCO's) to help their members gain access to micro-finance by negotiating with banks for loans. Farmer organisations can foster agricultural innovation by linking farmers with research and extension institutions to help ensure their programs are relevant to farmer needs and capacities, representing members in advocacy and policy processes that stand to benefit smallholders and securing access to resources for capacity development in diverse topics and skill areas. Community forestry organisations, water user groups, wildlife management clubs and other community-based organisations can help mobilize and coordinate efforts of farmers and their communities to manage natural resources.

Numerous CSOs work to strengthen farmer and community organisations and play other supportive roles in the agricultural economy. They can help engage local communities in government-led policy and planning processes regarding the use of land and resources. They assume strategic roles in partnership formation with government entities, and increasingly with private sector actors as Tanzania's agriculture becomes more business oriented. Such networks and partnerships can provide leadership in ensuring that innovation and institutional development for AGG is rooted in local knowledge systems, while simultaneously embracing new opportunities through technical and commercial advances in agriculture and natural resource management.

Some examples of CSO engagement in AGG in the Southern Corridor are highlighted below. By building on the strengths of organisations and initiatives such as these and expanding investment in their capacities to serve smallholder farmers and their communities, SAGCOT can harness the powerful assets of social capital, as well as financial capital, in its pursuit of sustainable food security throughout the Corridor.

MVIWATA is a national network of farmers' groups formed in 1993 that works to foster communication, information exchange and sharing of experience. The organisation is a locally based, nationally-engaged farmers' organisation that aims to ensure representation and advocacy of their members' interests in decision-making at all levels and to provide agronomic and marketing services including access to financial resources. MVIWATA farmers' groups have pioneered the adaptation and adoption of AGG production practices. In the Uluguru Mountain area of Morogoro Region, for example, they have replaced conventional cultivation systems with conservation agriculture including agroforestry and other soil fertility-enhancing measures through partnership with CSOs and government agencies. They have introduced new cash crops and dug water distribution canals for better management of irrigated agriculture in the region. In more drought-prone areas, MVIWATA farmers have adopted rainwater harvesting and a variety of water conservation and soil regeneration measures. MVIWATA documents how farmers have significantly improved their income levels and paid back small loans by applying these and similar ecologically restorative technologies.

The **Tanzanian Rice Partnership (TARIPA)**, one of the first SAGCOT Cluster investments, brings together key private sector actors involved in rice, including both large corporations and local smallholder rice associations such as the Association of Kilombero High Quality Rice Growers, with the Government of Tanzania (at national and local levels), development partners (World Bank, USAID, Norad, JICA, FAO) and a range of financial institutions. Through its partnership framework, TARIPA works with farmers associations and cooperatives to build small-scale farmer capacity to produce rice for market and increase value addition, while seeking also to scale up core value chain activities to catalyse significant small- and large-scale farmer and agribusiness development in the rice sector and support scaling up of commercial initiatives. TARIPA can play a critical role in making farmer associations aware of the green growth model, helping government to create an enabling environment for green growth, and initiating the replication and expansion of successful models

NAFAKA is a partnership project funded by USAID to improve rice and maize value chains through mechanisms that include improving smallholder access to input supplies through facilitation of small loans to farmers associations. NAFKA's aim to ensure that the benefits of more productive and profitable grain sectors reach women, youth and other vulnerable populations stimulate the five year initiative to invest in building the capacities of smallholders to participate in new business and growth opportunities through farmers associations and cooperatives. NAFKA has demonstrated interest in supporting the scaling up of a pilot smallholder training in SRI rice that was initiated by the Kilombero Rice Plantations Ltd. to rapidly accelerate the adoption of this AGG practice.

Tanzania Forest Conservation Group (TFCG) is an NGO that channels and delivers assistance to local communities to manage their forest resources in ways that improve sustainable harvest and reduce deforestation from charcoal and timber harvesting. One of numerous organisations and networks in Tanzania that account for the country's strong track record in participatory forest management, TFCG helps communities realize the economic, social and environmental values from their forest resources through capacity development, technical support, networking and advocacy. TFCG could help to incorporate AGG into participatory forest management to improve local livelihood and conservation outcomes by providing assistance to farmers and their communities in agroforestry as well as non-timber forest product (NTFP) management and marketing. By helping strengthen agricultural livelihood opportunities for forest users through the promotion of AGG practices, TFCG and its partners could reduce pressure to make charcoal and harvest timber to supplement incomes. REDD+ pilot programmes that TFCG and partners promote with participatory forest groups can help communities gain access to carbon finance in return for sequestering carbon. Pilot programmes could be expanded to better recognize the contribution of climate-smart agricultural practices to carbon storage and increase farmer access to carbon finance.

Water User Associations were established in 2009 by the Water Resources Management Act and the Water Supply and Sanitation Act. These establish policies for access to water resources and priorities for water use, and delegate irrigation governance to water user associations (WUAs). WUAs are granted the right to establish bylaws and enforce compliance to ensure fair access to water resources for domestic and socio-economic purposes. The Ilonga WUA in Kilosa District has been successful at bringing community leaders across the basin together to supervise water use for improved crop and livestock production as well as improve water quality by educating local communities. This has been achieved through a number of strategies, including planting of appropriate tree species along waterways, practicing conservation agriculture, keeping records of water use and users and implementing RWH where possible. With additional training and backstopping, the WUA model shows considerable promise to leverage local action to increase water use efficiency. For maximum benefit, WUAs will need access to additional finance and technical assistance, and must be part of a broader basin management strategy that addresses water allocation issues that transcend the purview of individual WUAs.

Strengthening local leadership to engage farmer associations, SACCOS and their communities in AGG initiatives will require government to strengthen the enabling environment. Government roles can include fostering awareness about green growth and SAGCOT, developing district investment profiles, systematizing land use planning for better policies and management, enforcing Environmental Impact Assessments for large projects and striving for effective enforcement of existing policies.

Government also can champion policies that build the capacities and influence of CSOs and local leadership in AGG. Through SAGCOT, CSOs such as the Tanzania NGO network (TANGO), the Mazingira network and others can share ideas and information about AGG practices and enhance the capacity of AGG extension systems, as well as strategies and capacities needed for partnering effectively with the private sector. In turn, SAGCOT can encourage CSOs to advise companies about ways to gain social acceptance in rural communities.

Private companies can play important roles. For example, PASS (Private Agriculture Sector Support Ltd) is a commercial entity that stimulates investment and growth in commercial farming. It is active in coordinating loans between farmers and Tanzania banks, most of which have financing windows for producer associations' agricultural activities. PASS provides entrepreneurship training through farmers' associations who demonstrate promise in commercialization. With adequate orientation to AGG investment opportunities, PASS could assist farmer organisations to develop business plans to finance AGG activity through new financing mechanisms like the Catalytic Fund.

By serving as a nexus for linking green growth leaders across different sectors and organisations, SAGCOT will strengthen the contributions of each while limiting potential conflict among them.

Extension systems for AGG

Extension services serve a key catalytic role in sustainable agricultural intensification by introducing farmers to new information, new practices, and new skills. This is particularly true in the smallholder sector, where the ideal agricultural inputs may be scarce or unaffordable, but with new knowledge most farmers can substantially increase productivity and profitability with the resources already available to them. Experience throughout Africa indicates agricultural extension to be among the most cost-effective strategies for alleviating poverty, ensuring food security, and fostering rural economic development.

The challenge for agricultural extension

Unfortunately, along with a broader neglect of agricultural development toward the end of the last century, public sector extension resources were cut dramatically, and the civic and private sectors have stepped in to fill the gap only to a partial degree. As of 2008, Tanzania had approximately 7,800 professional extension workers, compared to the 41,000 that would be recommended to adequately serve the nation's farmers. The GoT has begun to address this situation as part of its commitments to agricultural development, and has begun to hire new agriculture and livestock extension officers, with the aim of eventually establishing a staff of 28,000 extension workers. Some private companies and civil society organisations already have technical experts and strong extension programs in the Corridor. But for the most part, existing services do not yet focus significantly on AGG technologies and practices.

Extension approach and models for AGG

As the GoT expands its extension programs, there is a great opportunity to design and implement these programs to support Agriculture Green Growth. This would entail some changes to the current predominant extension model in the country. Table 5-2 identifies key features of AGG cropping, livestock, and resource management systems that distinguish them from conventional "Green Revolution" approaches, and the corresponding features of effective extension systems that are likely to support effective, lasting uptake of AGG practices.

Extension to support AGG practice and improve farm productivity will blend public, private and civic sector personnel and financial resources to tailor delivery systems to the knowledge and organisational needs of specific regions and communities. Strong AGG can bring together partners from the civic, public and private sectors to create locally-driven extension hubs that utilize technical expertise, local knowledge, and existing social capital among farmers and other community members to improve knowledge on AGG innovations and increase adoption by smallholders across the Corridor. They can draw on the existing capacities of government and non-government organisations that lie in agriculture, forestry, fisheries, wildlife, business management, and social service sectors.

The farmer and community organisations described above provide a sound institutional foundation for building extension that is cost-effective and responsive to the needs and capacities of farmers and their communities. A legacy of decentralization and local engagement in extension and research planning together with basket funding for national agriculture, food security and poverty alleviation development strategies further strengthens the potential for realizing an efficient, cross-sectoral extension system that draws upon multiple sources of innovation. A number of effective extension models are already in use in the Southern Corridor and other parts of Tanzania that can be adapted and combined to support AGG. The methods highlighted below use participatory, community-engaged, experiential, problem-solving, and/or multi-sectoral approaches to learning that are conducive to advancing a green growth approach.

Farmer Field Schools (FFS) use adult learning principles and participatory training methods to facilitate farmer groups in acquiring and applying sound agricultural practices throughout the production cycle (seed to seed). The approach emphasizes experiential learning through field trials and observations. A typical FFS involves a group of 20-25 farmers through which participants sharpen their decision-making capabilities, leadership skills, and

Table 5-2. Creating extension for AGG—what is different?

Characteristics of AGG farming systems	Corresponding extension needs
AGG systems may be seen by farmers as radically different from existing/conventional practice, and thus risky.	- Extension should include ample on-farm demonstrations, as farmers need to 'see it to believe it.' - Extension must harness and strengthen knowledge sharing about farming and related land use practices based on trust and peer relations.
AGG systems are knowledge intensive, based on managing the farm as part of an agroecosystem.	Extension must teach principles of agroecosystem management at farm and landscape scales.
Farming systems are adapted to each local context, not a simple 'cookbook' prescription.	Extension should spend a high proportion of their time in the field, helping farmers use local knowledge to decide how to fine-tune practices to local conditions.
AGG is an adaptive approach that responds to changing conditions.	Extension should include mechanisms to help farmers and their communities experiment for continual improvement and problem-solving.
Productive agriculture is predicated on sound natural resource management.	Extension curricula should include basics of soil, water, forest, grassland, wetland and habitat management.
The best AGG solutions sometimes require bringing in new ideas, technologies, or practices from outside the district or even the country.	Extension programs should be linked closely to universities and regional and international research and support centres, and extensionists should receive frequent refresher courses in new principles, practices, and technologies.

capacities for managing complex agroecological systems. There is precedent in Tanzania for linking FFS with local agricultural research committees to systematically evaluate technological alternatives and influence the research agendas of formal research organisations. The FFS methodology is incorporated into many DADPs; presently there are some 6,700 FFSs throughout the country. Significant yield increases are attributed to use of the method: for example, through FFS in Mvomero District, rice production increased by over 100 per cent from an average of 2.5 tons per hectare to 5–6 tons per hectare. Historically, one impediment to FFS implementation has been the need to cover transportation and per diem costs of GoT extension personnel to serve as FFS facilitators. Without such support, service to remote communities is typically lacking and FFS leadership may be sporadic and thus less effective.

Farmer-to-farmer extension trains farmers to train other farmers and thereby develop a cadre of locally based experts, or ‘paraprofessionals.’ Farmer trainers are selected by their peers to participate in courses at regional farmer training centres and other locations that qualify them to assist group members in farming techniques. Cross-visits are often used. The approach generates a high multiplier effect. For example, in one region 930 farmers were trained to train other farmers, leading to 69,750 additional farmers acquiring useful knowledge and skills—a multiplier ratio of 1:75. When the approach was introduced through the Kilimanjaro Agricultural Training Centre (KATC) in paddy irrigation schemes, paraprofessional farmers trained other farmers in groups of five at a time using their own fields to demonstrate good management practices from seed selection to harvesting. The KATC model led to paddy production increases from 2 to 6 tons per hectare and to the adoption of the model by at least three other agriculture training centres.

Extension through outgrower schemes or contract farming provides training to smallholder farmers as part of the support package that enables outgrowers to produce a consistently high quality and quantity of agricultural raw materials. Under this model, businesses that process and sell crops such as rice, sugar cane and tea secure reliable access to smallholders’ produce, while the companies provide producers with inputs, credit, and extension services in addition to a reliable market. The use of participatory extension methods in contract farming in Tanzania has been shown to help build trust between farmers and the company in addition to improving extension efficiency. Trusting relationships, and therefore better contract performance, can be enhanced by training farmers in business and marketing skills as well as production methods. Training may involve professional extension educators as well as well-educated ‘model’ farmers from local villages. In addition, company-based extension personnel sometimes help train other local farmers who may not be company contract farmers per se, as a service to the local community or in an effort to expand their raw material supply. An example of AGG extension support for outgrowers is the work of Kilombero Plantations Ltd. (KPL) to train local farmers in System of Rice Intensification (SRI). SRI demonstration farmers benefited from yield and profit increases in the first year, and are expected to pass their skills onto other farmers.

Extension led by civil society organisations (CSOs) frequently combines skills training in agricultural management with farmer organisation and empowerment to address the many dimensions of food, livelihood security and natural resources management. For instance, AMSHA Tanzania builds the capacity of rural farmers to become agricultural entrepreneurs through an innovative agribusiness model that pairs students in agricultural research organisations with local farmers in Kilwa District. AMSHA helps farmers organize into farmers’ associations and acquire the technical skills to meet their goals. In 23 villages where AMSHA works, farmers have become measurably more engaged in expanding farming businesses and implementing new technologies, while cooperation among them has grown. CARE is an international CSO that has worked to leverage GoT extension capacity by supporting teams of GoT, CARE, and local community educators to optimize their respective sources of knowledge and expertise for improving the lives of women farmers, their families and communities. The approach values the strategic roles of GoT extension specialists and mobilizes them for field work that government

agencies cannot always afford. CARE applies the approach in its conservation agriculture and agroforestry extension program in Morogoro region, among other locations.

ICT (Information Communication Technology) can dramatically multiply the information delivery capacity of extension systems. The use of radio, cell phone, and internet based media can be particularly vital in broadening the role of extension from production agriculture to include services that improve rural livelihoods including enterprise development and marketing. As telecommunication services in rural areas improve, opportunity for demand-driven extension services accelerates and diverse organisations engaged in extension activity are better able to harmonize their efforts. As the SAGCOT initiative takes root and new investment in telecommunications services provides the infrastructure necessary for doing business, ICT-based extension will become increasingly feasible and cost-effective.

An effective AGG extension system will be closely linked to agricultural research to prioritize and use new research on technology development, seeds and varieties and agronomic practices to increase productivity and resilience for the region's different farming systems and agroecological zones. Tanzania's system of zonal Research and Training Institutes (RTIs) coordinated by the Department of Research and Training (DRT), with Sokoine Agricultural University (SAU) at the hub, is well positioned to experiment with AGG practices that are suitable for specific regions. Curricula in AGG technology development and adaptation can be developed for education and training of researchers and extension educators at SAU and the respective RTIs. There is precedent for positioning PhD level professionals at RTIs to advance the research that will inform AGG extension in each Institution's respective zone.

An effective AGG extension system also will foster the development of 'resource centres' 'knowledge hubs', or 'information kiosks' in strategic locations throughout the Corridor where extension educators and leaders in local communities and organisations can readily access state-of-the-art knowledge and information to use in extension training and service delivery. Such resource centres would make use of internet, cell phone and other ICTs, and be used to access information about input availability and prices as well as product marketing opportunities for crops, NTFPs, fish and livestock. The centres would be designed also as meeting places where farmers, herders, fisherfolk, local forest and water managers, wildlife managers and other community members could meet for 'refreshers' about relevant advances in AGG technologies, institutions and impacts. Programs would adopt designs and best practices to address needs and schedules of women farmers and resource managers.

Operationalizing an AGG extension strategy

A three-pronged strategy will catalyse a vibrant AGG extension initiative. First, existing extension personnel in government organisations must be motivated and mobilized to deliver effective programs by ensuring that financial resources for travel to the field are adequate, and are disbursed and utilized in a timely way.

Second, public, private and civic sector extensionists and extension paraprofessionals must be systematically trained about context-appropriate AGG practices. This training needs to be coordinated and harmonized across the multiple sectors providing extension and outreach services including agriculture, livestock, forestry, wildlife, water resource management, social and health services, business management and related sectors.

Third, the AGG extension program should be mobilized in priority clusters with clear targets and thoughtful monitoring designed to extract and apply lessons learned from early experience. This system of 'learning by doing' will accelerate the technical and organisational proficiency of the system. Together, these core elements of the AGG extension investment strategy should facilitate broad reach of the extension program followed by widespread adoption of AGG, first in the Clusters and eventually throughout the entire Corridor.

In addition to providing instruction in AGG practices and technologies, the extension system will facilitate access to credit, seed and other inputs that are vital to productivity and resource use efficiency. It will also provide access to integrated planning tools and processes to enable extension and outreach providers from diverse sectors to harmonize the design of their programs, training curricula and delivery systems to realize AGG objectives.

AGG extension targets

As noted earlier, AGG can increase smallholder production and productivity dramatically across the Southern Corridor if applied at scale. The extension targets below (Table 5-3) propose a roll-out trajectory for the AGG extension program that would achieve aggregate goals, yet remain within the constraints of financing flows for extension that are realistic from the public, private, and civic sectors. It is anticipated that the reach of the extension program as well as adoption rates would begin slowly but accelerate over time as extension activity becomes more efficient, training materials and systems are developed, and AGG practice becomes more widely demonstrated, profitable and socially acceptable.

whose members coordinate their efforts to provide a strategic set of trainings and participatory methods designed to correspond with the agroecological, socio-economic and institutional conditions in each part of the Corridor. These AGG Extension Units will typically include at least one GoT extension professional; at least one CSO extension professional and/or at least one private sector extension professional; and at least eight paraprofessionals (approximately double the number of professionals).

Each team would be resourced with regular training in AGG approaches and practices, with transportation and communication support, and with finances to conduct seminars and other capacity development activities with farmer organisations and local leaders. AGG extension teams together with these knowledge and mobility resources will comprise an 'AGG Extension Unit'. The Units will be organized to ensure cross-sectoral expertise in production and marketing of field crops, horticulture, livestock, trees and other natural resources, enterprise management and social services. GoT extension workers in each Unit will spend an average of about half their time on AGG activities, depending on the status of AGG knowledge and opportunities in their respective regions. The Units will catalyse partnerships with other GoT extension programs, CSO programs and commercial producers and will optimize the use of paraprofessional extension workers and of ICT to expand the impact of their effort. Regular participation in AGG training seminars will ensure that knowledge within the Units is up to date and informed by on-going research. The approach will result in progressively increasing numbers of farmers reached per Unit over time as farmers increasingly learn from one another, both formally and informally. Knowledge and information about AGG will also become increasingly widespread and available, supporting

Table 5-3. Trajectory for AGG extension and adoption.

The table provides estimates of the number of farm households reached by AGG extension, and the number that adopt context-appropriate AGG approaches, in the Southern Corridor in 20 years.

Year	Farm households reached		Farm households adopting	
	Per cent	Number	Per cent	Number
After 3 years	4%	52,448	2%	26,224
After 8 years	13%	182,159	7%	98,086
After 13 years	35%	524,097	15%	224,613
After 18 years	70%	1,120,155	40%	640,088

Table 5-4. Projected roll-out of the AGG extension program

The table indicates the number of AGG Extension Units (as described in the narrative) projected for each five-year period through 2030. The roll-out projections are intended to maximize success in achieving the Greenprint's aggressive scaling-up targets, subject to anticipated budgetary constraints and time required to design and implement quality, evidence-based extension programs.

Year	Nubmer of extension units	Households reached per unit	Total farm households reached
After 3 years	22	2,384	52,448
After 8 years	49	3,717	182,159
After 13 years	125	4,192	524,097
After 18 years	205	5,464	1,120,155

additional spontaneous uptake of AGG practices. Table 5-4 projects the number of AGG Extension Units that will be needed to meet the reach and adoption targets presented above.

AGG extension costs

The costs of supporting the AGG Extension Units include salaries and field allowances for professional extension workers, stipends for paraprofessionals, motorcycles and fuel, bicycles, and cell phone allowances to motivate and mobilize the teams. Additional costs include participation by extension workers and by farmers in training seminars, cross visits, and field days, as well as the development of demonstration plots as knowledge resources. Based on this structure, the Green Growth Technical Team prepared itemized budgets for the proposed AGG extension roll-out (see Table 5-5). It is expected that the public, private, and civic sectors will each invest in AGG extension, with differing objectives and priorities. The AGG Extension Unit model is an approach to creating synergies among these multiple investment flows by establishing a common orienting objective, principles, and access to training materials on diverse technologies and best practices to support AGG. As noted in the table, the civic sector, represented primarily through the numerous NGOs and international organisations that operate in

Table 5-5. Projected investment needs for an AGG extension program.

The table estimates the cost of the proposed AGG extension program, including the portion of these costs expected to be borne by the government, civic and private sectors. Costs are in US dollars based on 2012 exchange rates.

Year	Government cost	Civic sector cost	Private sector cost	Total cost
After 3 years	837,147	2,076,124	435,316	3,348,588
After 8 years	3,127,979	7,757,387	1,626,549	12,511,914
After 13 years	8,673,062	21,509,194	4,509,992	34,692,249
After 18 years	17,776,607	44,085,985	9,243,836	71,106,427
Total (% of total)	30,414,794 (25%)	75,248,690 (62%)	15,815,693 (13%)	121,659,178 (100%)

the Southern Corridor, will finance the highest proportion of the costs, followed by the GoT and then the private sector through its extension support to smallholders who do not participate directly in contract farming schemes.

Collaborative approaches to SAGCOT Cluster development

The Blueprint highlights the importance of coordinating investments and activities at the scale of the SAGCOT clusters. In fact, this scale is equally important for addressing issues of land and resource availability and rights, wildlife conservation, watershed protection, and many others. Yet, there is currently little capacity to plan at this scale. As a result, regional economic development planning (e.g., designation of agricultural investment hubs and identification of suitable sites), environmental planning (e.g., for land, water, and wildlife), sectoral planning (e.g., priorities for investment in agriculture, livestock, and water), business planning (for siting activities and selecting supply chain partners) and participatory community planning tend to be carried out as separate workstreams that are poorly coordinated. The purpose of establishing new integrated landscape planning capacity at the Cluster level is to align these planning processes for mutual benefit. Since SAGCOT Clusters are not recognized administratively, such planning could take place by enhancing the capacity, mandate, and information base to plan at the district level. .

While businesses have historically been wary of engaging in such multi-stakeholder planning and coordination processes, this is changing notably elsewhere in the world. A recent publication from the Landscapes, for People, Food, and Nature Initiative documented 27 cases throughout the world in which agribusinesses are working at the landscape scale to improve profitability while addressing sustainability challenges. Business rationales for these activities included addressing local community relations, operational risks, investor requirements, sustainability and quality of supplies, value chain efficiencies, voluntary standard compliance, corporate social responsibility and reputational risks.¹

In broad terms, collaborative planning at the Cluster or district level within the Southern Corridor would follow a three-step process. First, a systematic assessment of economic, agricultural and environmental constraints and opportunities would be conducted at the district and/or cluster scale. This exercise would involve integrating a range of existing data (e.g., on land use, agricultural potential, water availability, wildlife habitat and movement, poverty rates, and other themes) along with some new mapping and data collection as needed. At the same time, a consultative process would be conducted with multiple levels of government, local communities, and the private sector to understand plans and priorities of each sector in the district or cluster, economic development opportunities and needs and priority community concerns. Plans and input already generated through participatory processes such as the CIPs and DADPs would also be integrated. This process would take approximately one year and result in: 1) a robust information base for subsequent village and sectoral planning; 2) identification of locations and issues where coordination across multiple jurisdictions or sectors is critical to achieve Green Growth objectives, such as for watershed management and wildlife corridors; and 3) a preliminary set of top priorities for supporting AGG and attracting beneficial investment, including land and infrastructure needs for developing efficient, vertically integrated agricultural hubs.

Building connections, trust and shared vision among leaders from different sectors is critical to the process. Well-designed leadership workshops that focus on the planning needed to locate and scale up AGG innovations in particular landscapes with the aid of spatial planning tools are particularly well-suited to help forge those links. The SAGCOT Green Growth Leaders Workshop conducted in 2012 provides an example of AGG innovation planning with the aid of integrated landscape maps. Many resources are available from the Landscapes for People,

¹ Kissinger, G., A. Brasser, and L. Gross, 2013. Reducing Risk: Landscape Approaches to Sustainable Sourcing. Washington, DC. EcoAgriculture Partners, on behalf of the Landscapes for People, Food and Nature Initiative. http://landscapes.ecoagriculture.org/global_review/reducing_risk

Food and Nature Initiative partners to support these multi-sectoral collaborative planning processes (www.landscapes.ecoagriculture.org).

The second step is to use this integrated planning foundation as input to developing specific plans in concert with key sets of stakeholders. For instance, participatory village land use planning will be conducted throughout priority districts and clusters. However, rather than conducting VLUPs as isolated exercises, the broader planning foundation will help communities identify and consider opportunities to collaborate with neighbouring villages or outside investors to achieve their development aims, conserve important forest and water resources, minimize the potential for land and resource conflict and advance AGG innovations. The VLUP enables communities to exercise self-determination over their development trajectory, guided both by their own local knowledge and traditional planning practices, and by relevant information from the regional planning foundation, which can be integrated through a variety of methods. Similarly, other planning processes such as the CIPs, water basin planning, planning for conservation areas, and sectoral planning would use the planning foundation to harmonize activities and investments. It may be theoretically less efficient to conduct such multiple planning processes. But in reality this is the most feasible way to increase harmonization and coordination while giving strong voice to the multitude of stakeholders (including women, indigenous people and others who may sometimes be marginalized) and respecting Tanzania's existing political and administrative systems.

The third and final step is to 'roll up' village and sectoral plans into an integrated district or cluster plan, and to use this plan as a basis for advancing AGG innovations, developing supportive policies and monitoring progress over time. At the same time, increased emphasis must be placed on implementing plans through appropriate mechanisms, including land titling processes, development of land banks, allocation of public programmatic funds, and identification of priorities for development partners.

Of course, the three-step process described here must not be a one-off exercise. Rather, it is an iterative process in which the planning foundation (step one) is continually improved and updated; village, sectoral and AGG innovation action plans are periodically revised; and monitoring leads to the adaptation of strategies to improve results.

Specific needs and first steps

While the collaborative planning process described above is not simple, in fact Tanzania already has in place most of the resources and institutions to make it happen. With some support from the SAGCOT Centre, its stakeholders, government leaders, and development partners, it is possible to mainstream a process for coordinated, evidence-based, participatory planning and action in just a few years' time. Specific actions needed to mainstream this process include:

1. Develop an in-country Green Growth data facility

Currently, data and spatial information relevant to Green Growth and investment planning is scattered across many ministries, NGOs, and universities. Creating an integrated data facility would enable planners, communities, and leaders at all levels to use the best available information to make decisions. New technologies allow for efficient, user-friendly management and use of such key information.

2. Increase capacity for collaborative district- or cluster-level planning

District and clusters are often the scale at which it is most important to address key conflicts and synergies. Investment in increased professional and local organisational capacity to implement the three-part planning process described above will benefit communities, investors, and conservation interests alike. Formal and informal leadership from diverse sectors and organisations who are motivated to bring their ideas and networks

into AGG district and cluster level landscape planning processes should be encouraged and enabled to participate.

3. Increase capacity for conservation corridor planning across administrative boundaries

Conservation corridors are critical for the maintenance of wildlife populations, many of which form the basis of Tanzania's vibrant game hunting industry and burgeoning tourism industry. Of the thirteen wildlife corridors identified in the Corridor, at least half are critically threatened. Fortunately, the SAGCOT Corridor hosts numerous public and civic institutions with a wealth of knowledge on the Corridor's biodiversity and which, in many cases, have ongoing efforts to protect these key areas in pockets throughout the Corridor. It will be important to bring together these institutions with SAGCOT business leaders and investors and with local communities and district officials to examine these issues together. With maps and dialogue these leaders and stakeholders can develop concrete strategies and action plans for reconstructing wildlife corridors, handling human wildlife conflict around them and instituting the wildlife corridor planning process into formal village land use planning processes that designate land for community use and investment.

4. Establish a functioning land bank

A centrally administered land bank should be established and professionally maintained to link investors to suitable sites in an efficient, transparent, and equitable manner. In the immediate term, the land bank may be populated with several sites under government ownership that have clear title and status. Basic information about all sites in the land bank should be publicly available on a GoT or SAGCOT website, and can also be incorporated into investor outreach efforts such as the SAGCOT Investment Partnership Program.

5. Mainstream VLUP throughout the Corridor

Village land-use planning is a key mechanism by which land is formally identified and designated for community use and investment. Yet, such planning is relatively costly given that there are thousands of villages in the Corridor. One approach is to set up a VLUP Revolving Fund, which would initially be seeded with some of the resources earmarked for land planning support as an ancillary part of the World Bank's SAGCOT Catalytic Fund investment. Through the VLUP process, lands suitable for investment are identified and placed in a Corridor-wide (or national) investment land bank. As investors decide to acquire and develop available sites from the land bank, they pay a fee in consideration of the pre-acquisition costs already incurred for planning and site identification. This fee is returned to the revolving fund to enable VLUP to be conducted in new areas. In this way, the planning process is de-coupled from the pressured context of site identification for specific investors (who often fund the VLUP processes in hopes of acquiring suitable sites). Communities (in consultation with districts) can identify investment sites in a pro-active manner, while investors can immediately see the full portfolio of available sites and choose a suitable site with no need for time-consuming and uncertain negotiations with communities. (Of course, investors should still expect to negotiate with communities in relation to benefits, profit-sharing, or cooperation.) The first tranche of resources from the VLUP Revolving Fund should be used to conduct planning in clusters of contiguous villages within investment-ripe portions of the priority clusters.

6. Formalize the rights and procedures associated with VLUPs

To take full advantage of the planning that is conducted, a streamlined process for implementing spatial plans through the designation of individual, communal, and investment lands should be developed and applied as the final step in the VLUP process. This process should be designed with the aim of increasing land security for small-scale farmers and communities, while recognizing that formalization does not always equate to increased security. Experiences from implementation of the Strategic Plan for Implementation of the Land Laws (SPILL) will be instructive in this regard. In addition, a formal set of guidelines should be developed for revising VLUPs that are already in place. While it is reasonable that plans will need to be modified over time, it is important

that the amendment process not provide an easy vehicle for investors or other powerful interests to supersede the legitimate self-determination of local communities.

7. Use the VLUP process to resolve reconcilable conflicts

In the past, issues such as boundary disputes between adjacent villages have inhibited effective planning or implementation of plans. Efforts to identify and address such conflicts should be part of the VLUP process, particularly given that land use planning will be conducted simultaneously in groups of adjacent villages that may share common interests as well as some areas of conflict.

8. Establish a strong mandate and platform for inter-sectoral coordination

A planning process for cluster development will be most effective if sectoral planners and policy makers are willing to consider information, plans, and priorities from other sectors, through the process of information sharing and coordination described above. For instance, if spatial priorities for irrigation development, wetland conservation, and wildlife habitat are considered together, investment in all three areas can be better aligned, while some win-win solutions (such as investment in increased water use efficiency for agriculture) may be identified and deployed. To the extent that such coordination requires shifting how Tanzania's ministries operate, there must be high-level commitment to do so.

This is not an exhaustive list of needs related to collaborative approaches to AGG development in the Clusters. Rather it is a set of top priorities to put in place the processes to support collaborative AGG planning and development.



6. Finance and investment for AGG

The Green Growth approach involves engaging a wide range of investors, going well beyond typical business-as-usual agricultural investment. This chapter describes the different categories of investors and their anticipated roles in the AGG strategy and suggests ways to generate new Green Growth investment, including branding the Corridor as a centre of AGG innovation and business opportunity.

Types of agriculture green growth investors

By taking a broader view of investment in land and agriculture that includes diverse types of investors, it is possible to increase the total pool of capital available to support sustainable agricultural development while generating new synergies among different investments.¹

The SAGCOT Blueprint identifies three main pools of capital that will finance agricultural development and supporting infrastructure in the Southern Corridor: private sector investment (projected at US \$2.1 billion over 20 years), public sector resources (projected at US \$650 million over 20 years), and a multi-donor catalytic fund (projected at US \$50 million during the first several years of the SAGCOT Initiative). The Blueprint also identifies some innovative ways in which these resources could be combined and leveraged to support early-stage agricultural investment that is critical for jump-starting progress but is typically too risky for market-rate investors. For instance, capital from social impact investors (who seek multiple bottom line results – financial, social, environmental) could be combined with market-rate equity finance to establish a “patient capital” fund to finance local infrastructure.

But there is a new calculus for investment that explicitly recognizes additional business risks and opportunities related to environment and social relations (Table 6-1).

Reflecting this new calculus, the Greenprint recognizes four additional sources of capital as critical for investments in AGG (Table 3-2). These include:

1. Small-scale farmers and farmer/community associations

According to the projections of the SAGCOT Blueprint, commercial farms and outgrowers will comprise up to 15 per cent of agricultural land in the Southern Corridor by 2030. That means that small-scale farmers and farmer/community associations unassociated with commercial farms will be the principal investors for 85 per cent of the Corridor’s agricultural land. Tanzania has a long tradition of grassroots-led investment in agriculture and rural enterprise through savings and credit cooperatives (SACCOs) and other models. Meanwhile, new sources of debt finance are beginning to serve the smallholder sector and its specific needs and there is strong potential for expansion.

¹ The word “investment” can be used in many different ways. Here, we use the term to refer to financial expenditures or in-kind expenditures (e.g., of household labour) made in anticipation of gaining future economic returns that, when discounted, exceed the amount of the initial expenditure. We also consider “social investments” in which expenditures are made in anticipation of gaining tangible, quantifiable benefits for human or societal wellbeing (but not necessarily financial returns). These different definitions of “investments” reflect the different bottom line criteria by which different categories of investors evaluate and prioritize investment opportunities.

Table 6-1. The new calculus for private investment.

Key factors typically included in traditional business decision-making (old model), as well as those factors now increasingly included in decision-making related to investment in land and agriculture (new model).

Old model	New model
• Risk-adjusted return • Capital and operational expenditures • Discounted cash flow • Risks (e.g., crop failure, political instability, currency fluctuations) • Product differentiation based on quality and/or marketing	• Risk-adjusted return • Capital and operational expenditures • Discounted cash flow • Risks (e.g., weather, crop failure, political instability, currency fluctuations) • Additional risks (e.g., climate change, water scarcity) • Product differentiation based on quality, marketing, and/or social and environmental credentials • Corporate or brand reputation and image as a “good business actor” • Market access and “license to operate” linked to social and environmental performance

2. Civic sector

The civic sector includes local, national, and international non-governmental organisations. These groups are key investors in agriculture and rural development, as well as catalysts of further investment by small-scale farmers and associations. The civic sector typically prioritizes social and/or environmental returns, usually tied to economic improvement for a target population. Financing for civic sector investments ultimately comes from a wide range of donor and philanthropic sources, including bi- and multi-lateral donors, private foundations, and individual membership contributions. Civic sector groups focusing on agriculture and food security, rural development, health, environment, and other areas are all active in the Corridor.

3. A new class of social investors

The world of social investing has not only grown rapidly in recent years, but also diversified, reflecting the wide breadth of objectives, profit expectations, and sectoral foci of social investors. In addition to those categories of social investors identified in the Blueprint, a new set of sustainable agriculture investment funds is coming online. More and more international investors and companies are also following sustainability screening criteria, which introduce social and environmental considerations into investment decision-making.

4. Climate finance

There is substantial potential for international climate finance to support sustainable agriculture in sub-Saharan Africa. Donors have made commitments totalling US \$30 billion per year in 2012 and US \$100 billion per year by 2020 for adaptation and mitigation funding throughout the developing world. While institutions in Africa are developing strategies to use these funds efficiently, so far only a small fraction of this potential has been realized. Nationally Appropriate Mitigation Actions (NAMAs)—voluntary mitigation actions pledged by developing countries to receive finance and technical assistance—while not yet functional, appear well-suited to support sustainable agriculture. The primary channel for adaptation finance has been funds linked to the UN Framework Convention on Climate Change, and these have been supplied largely for agricultural projects in Africa. In addition, a growing cohort of private foundations and international NGOs, such as CARE, Oxfam,

“Sustainable and broad based growth can only be realised through ... widening the spectrum of actors in the economy, particularly the informal sector, SMEs [small and medium enterprises] and the cooperatives.”

— United Republic of Tanzania, *National Strategy for Growth and Reduction of Poverty (MKUKUTA)*

and Conservation International, are joining with national NGOs and farmer organisations to make climate-focused investments in African agriculture.²

5. Conservation finance

Agricultural investments are increasingly being made as part of watershed management and environmental conservation programs, as the latter recognize the crucial role of stewardship by farmers and forest communities. For example, the CARE-WWF Alliance was formed explicitly to implement joint programming for food security and biodiversity conservation. REDD+ and other forestry programs are linking with farmers to achieve their goals.

Table 6-2. Agriculture Green Growth investors and investments.

The table identifies the major categories of investors (table rows) and investment types (the right-most two columns) that can support Agriculture Green Growth. Investor categories and types shaded blue are the focus of the original SAGCOT Blueprint. Those highlighted green are additional investor categories and types included in the Greenprint to expand the total flow of capital and foster new inter-sectoral partnerships.

Investor category	Sources of funds	Investment types	
		Agriculture production, value chains, and infrastructure	Supporting investments in agriculture and other sources
Government of Tanzania (public sector)	- General revenue - Development partner support	- Roads and rail - Irrigation - Power grid - Agricultural research	- Capacity development - Natural capital
Tanzanian and foreign companies (private sector)	- Companies' capital - Conventional equity and debt financing - Social & patient capital - Development partners	- Agricultural production - Agricultural storage, processing, distribution, and marketing	- Forest, rural energy, and fisheries - Natural capital

² Source: Shames, S., R. Friedman, and T. Havemann. 2012. Coordinating Finance for Climate-Smart Agriculture. Ecoagriculture Discussion Paper no. 9. Washington, DC: EcoAgriculture Partners.

Investor category	Sources of funds	Investment types	
		Agriculture production, value chains, and infrastructure	Supporting investments in agriculture and other sources
SAGCOT Catalytic Fund (quasi-public sector)	Development partners	- Agricultural production - Agricultural storage, processing, distribution, and marketing	- Forest, rural energy, and fisheries - Natural capital
Small-scale farmers and associations (private sector)	- Individual or association capital - Debt financing from lending institutions - Social & patient capital	- Agricultural production - Agricultural storage, processing, distribution, and marketing	- Forest, rural energy, and fisheries - Natural capital
Various civic sector investors (civic sector)	Philanthropic sources	- Agricultural production - Agricultural storage, processing, distribution, and marketing	- Forest, rural energy, and fisheries - Natural capital - Capacity development
Additional social investors (public, private, civic, or hybrid)	- Foundations, donors, NGOs, and businesses - Quasi-public funds - Individual investors	- Agricultural production - Agricultural storage, processing, distribution, and marketing	
Conservation finance	Foundations, donors, NGOs, and businesses	- Ecologically compatible agriculture - Technical assistance - Payments for ecosystem services	- Forest, rural energy, and fisheries - Natural capital - Financing protected areas, including buffer zones
Climate finance (public, private, civic, or hybrid)	- Private companies - Multi-lateral agencies/donors - Development partners	- Climate-smart agriculture - Projects to reduce agricultural greenhouse gas emissions - Projects to reduce deforestation by intensifying agriculture	

Inclusion of these additional categories of investors in the SAGCOT strategy will help forge partnerships to overcome hurdles that have so far prevented a blossoming of Tanzanian agriculture. As in the original Blueprint strategy, this will be achieved by co-locating and coordinating investments in agricultural inputs, production, processing, distribution, and infrastructure to ensure that there remain no significant bottlenecks to well-functioning agricultural value chains. For instance, an NGO-led project on crop or livestock development could provide the agricultural raw materials for an energy-efficient processing facility that is financed by private investors but subsidized by a climate change mitigation fund. In this example, the inclusion of investors who do not expect market-rate financial returns helps to fill key gaps in the development of sustainable agricultural value chains.

AGG also places a strong emphasis on investments that can complement direct investment in crop and livestock production and processing to achieve the ultimate objective of sustainable food security, landscapes, and rural livelihoods (Table 6-2). These complementary investments include:

- Investment in other productive sectors, specifically forests and fisheries;
- Investment in distributed rural energy based on biomass and other renewable sources;
- Investment in “natural capital”—that is, functioning ecosystems that provide the basis for economically valuable goods and services such as clean water and nature-based tourism;
- Investment in capacity development, including extension, learning, and entrepreneurship training; and
- Investment in research and development for new technologies and practices for sustainable crop, farm, range, and landscape management.

Greening existing sources of finance

Many private, public, and donor-supported financing streams are currently supporting agricultural development in the Southern Corridor. Few of these financing sources explicitly favour AGG projects and investments, but most have objectives that are compatible with—and could be advanced by—increased support for AGG. These include:

- **Tanzania’s Agriculture Sector Development Programme (ASDP):** This program has an overall budget of US \$1.78 billion over 8 years, of which about 75 per cent is earmarked for irrigation development. Opportunities exist to more effectively leverage this funding with private co-financing; design water-saving irrigation investments; and increase funding support for AGG agricultural extension as proposed in Chapter 5.
- **The African Development Bank, International Fund for Agricultural Development (IFAD), and Alliance for a Green Revolution in Africa (AGRA):** These international development banks and donors are providing approximately US \$155 million for marketing infrastructure, value addition, and rural finance support programs. All of these types of investments are critical to support AGG. Rural finance support, in particular, could be structured to favour investments in sustainable intensification based on its anticipated profitability and lower risk profile compared to high-input approaches that do not incorporate water and soil conservation practices.
- **AGRA/Standard Bank and AGRA/National Microfinance Bank:** AGRA has established a US \$25 million loan guarantee facility to support Standard Bank and the National Microfinance Bank with the goal of supporting established and commercially viable agriculture businesses that incorporate smallholder farmers.
- **Domestic lending to agriculture:** In 2008, domestic lending to agriculture in Tanzania was TzSh 540 billion (approximately US \$360 million). However, less than 8 per cent of this finance flow (US \$29 million) financed primary agricultural production.
- **Microfinance:** NMB, AGRA, and the Financial Sector Deepening Trust (FSDT) are providing US \$6.3 million for an agricultural loan program for outgrower input finance.
- **Private Agricultural Sector Support (PASS):** PASS is a facility to support small businesses with technical assistance (e.g. business plan development, feasibility studies, and organisation of farmer groups) and financial services (e.g., loan guarantees) focused on agricultural production and processing businesses.

New sources of finance for AGG

Tanzania and Africa in general are experiencing unprecedented growth in private agricultural, forestry and related investment. Yet only a few investors have made an explicit business commitment to advancing rural development, poverty reduction and protection of ecosystem services and biodiversity in addition to private profits. SAGCOT, through its Agriculture Green Growth strategy, has the motivation and potential to attract these investors, particularly with a proactive effort to market the enabling environment for such innovative investments. Four sets of investors are of particular interest: sustainable agriculture investment funds; climate change mitigation funds; debt finance with 'green' screening criteria; and companies investing in agriculture that incorporate environmental and social values in their business models.

Sustainable agriculture investment funds

A growing number of social investors and impact investors are setting up funds, usually linking private finance with financing from NGOs or philanthropic organisations. Some promising examples for Tanzania include:

- **Inari:** This innovative initiative was developed by The Munden Project for investment in sustainable land management at scale in the developing world. The initiative is designed to drive financing to sustainable producers, in a way that improves their livelihoods and protects the environment. It seeks to accomplish this by aggregating payments from those producers into investment grade securities that offer a compelling risk-reward profile.³
- **African Agricultural Capital Fund:** In 2011, USAID established a new fund to support agriculture-based businesses in Africa. Pearl Capital Partners (PCP), a specialized African agricultural investment fund manager based in Kampala, Uganda, will invest the AACF's US \$25 million in at least 20 agriculture-related businesses in East Africa. To attract investors, USAID's Development Credit Authority is guaranteeing 50 per cent of an US \$8 million commercial loan from J.P. Morgan's Social Finance Unit to AACF. The fund is also supported by US \$17 million in equity investment from the Bill & Melinda Gates Foundation, the Gatsby Charitable Foundation, and the Rockefeller Foundation. The fund will also have access to US \$1.5 million in USAID-funded business development services, primarily funded under the Feed the Future initiative, to improve investee companies' operations, competitiveness, and access to markets. PCP's model focuses on building the skills of local management teams rather than infusing management expertise from abroad. The fund's co-investors are all members of the Global Impact Investing Network (GIIN) Investors Council. USAID, J.P. Morgan, and the Rockefeller Foundation are anchor funders of the GIIN, which is a nonprofit organisation dedicated to increasing the scale and effectiveness of impact investments.
- **EcoEnterprises Fund:** The EcoEnterprises Fund, operating since 2000, is a pioneer in impact investing that provides capital to small and medium-sized businesses that have important positive impacts on ecosystems. The EcoEnterprises Fund II will soon be launched. The current focus is Latin America, but African opportunities will also be explored.⁴
- **Sustainable Landscapes Investment Fund:** Through its multi-sector Platform for Biodiversity, Economy and Ecosystems, The Netherlands is in the process of developing a Sustainable Landscapes Fund to mobilize private sector investment, supported by the philanthropic and public sectors. SAGCOT can actively market investment ideas with this group, based on the several ready-to-go landscape investment opportunities identified in this report and by SAGCOT stakeholders.
- **Rabo Sustainable Agriculture Guarantee Fund:** The world's largest agricultural bank, Rabobank, recently established a fund that uses screening criteria to ensure the sustainability of its agriculture investments.
- **International Finance Corporation:** The IFC now has in place a number of different windows for private sector loans that have strong environmental and social co-benefits. These include expansion of eco-certified

³ For more information, see <http://www.fao.org/docrep/016/ap076e/ap076e.pdf>.

⁴ For more information, see <http://ecoenterprisesfund.com>

agricultural commodity production, investments that will improve water management in agriculture, and sustainable forestry. IFC also has advisory services set up that could work with SAGCOT on pre-investment planning.

- **Root Capital:** This nonprofit finance organisation provides credit to small and growing businesses in rural areas that require more than a microloan but are not yet qualified to receive conventional commercial credit. Its short term loans allow businesses to buy raw goods from farmers, thereby supporting aggregation and marketing to connect small-scale farmers to markets. Root Capital also makes some longer-term loans to enable businesses to build infrastructure. Root Capital has funded several Tanzanian businesses, including an Arusha-based organisation called Nyirefami, which processes and exports millet, wheat, sorghum and bananas. This and similar models could be scaled up to build capacity and create access to credit to grow small rural businesses in the Clusters.

Climate mitigation investment funds

Other private sector funds have been established to support terrestrial carbon sequestration and avoided deforestation.

- **Livelihoods Fund:** The Livelihoods Fund is a carbon investment fund that has three criteria for investments: social impact, environmental impact, and carbon sequestration. The fund mobilizes companies, financial institutions, and large foundations, which invest their money in a 30-50 million euro mutual fund. The fund then uses this money to finance programs in the field. In return, investors receive carbon credits to offset their own greenhouse gas emissions or sell the credits to others. All fund programs are registered under existing CDM or VCS carbon accounting methodologies. The fund aims at the highest quality social and environmental standards, such as the Gold Standard or CCBA. A rigorous process is followed to measure the carbon sequestration and register the projects through the United Nations Framework Convention on Climate Change. Four companies have invested so far: Danone, Schneider Electric, CDC Climat and Credit Agricole.⁵
- **Company-based Voluntary Carbon Offset Projects:** A number of private companies are seeking to bolster their credentials on sustainability by investing in land-based carbon projects to offset their greenhouse gas emissions. To enable them to do so, several intermediary carbon project developers have been established to implement sustainable land-based projects and sell the resulting carbon credits. For example, WildlifeWorks is a private climate fund investing in voluntary and CDM carbon credits, which are then sold to companies marketing consumer products such as clothing. The group's first certified REDD+ project investment was recently initiated in Kasigau, Kenya.⁶
- **Terra Global Capital:** Terra Global has an investment fund that seeks assets for land use-related climate offset investments.⁷

Financial institutions with sustainability screening criteria

Increasingly, international lending institutions are incorporating sustainability screening criteria into their lending processes. This means that projects seeking financing are more likely to be able to obtain it—or to receive better financing terms—if they fulfill criteria related to social and environmental performance. One example of such criteria is the Equator Principles, which international banks voluntarily adopt as a stated commitment to avoid investing in enterprises involved in tropical deforestation. As of 2012, 77 financial institutions in 32 countries have adopted the Equator Principles, collectively representing more than 70 per cent of international debt finance in emerging markets.

⁵ For more information, see <http://www.livelihoods.eu/livelihoods-funds.html>.

⁶ For more information, see <http://www.wildlifeworks.co.uk/>.

⁷ For more information, see <http://www.terraglobalcapital.com/>.

Private investment incorporating environmental and social factors into business models

There is particular value to SAGCOT in attracting international companies that have already developed business models that incorporate environmental and social values. These not only may find it easy and appealing to align with the AGG strategy, but also bring valuable technical and business expertise that can enhance capacities in the region. Hosting companies that carry their own branding related to sustainability can enhance the reputation of the region as a whole and attract other such companies.⁸

While numerous such companies exist, it will require deliberate effort on the part of the SAGCOT Centre, GoT, and other stakeholders to encourage them to invest in the Corridor. As part of the SAGCOT Investment Partnership Program, the SAGCOT Centre can undertake an identification and screening process to select candidate companies and proactively approach them to explore investment opportunities in the Corridor. One starting point would be to approach the major international commodity roundtables (for sugar, soy, beef, and biofuels) to identify industry leaders in sustainable production.

Principles for AGG investment

Across Africa and around the world there is currently a spirited debate on the merits of foreign investment in land and agriculture. One argument, exemplified by the World Economic Forum's New Vision for Agriculture, highlights the important role of international capital and expertise to work hand-in-hand with local communities to jump-start productive agriculture and economic growth. The other viewpoint raises alarm at the recent rash of "land grabs" across Africa that have given foreign investors control over vast land and water resources, often with little concern for—and at great risk to—the environment and the well-being of local communities and the host country.

Despite the polarized nature of this debate, however, most mainstream voices agree that land investment itself in neither inherently good nor bad. Instead, its impact hinges on where and how the investment takes place. There are two key dimensions to attracting investment that is widely beneficial and equitable. The first is to proactively identify and seek out desired categories of investors, and to create for them a clear and predictable procedural roadmap for investment. The SAGCOT Centre is already pursuing this tack through its SAGCOT Investment Partnership Program and collaboration with the GoT to identify and address key policy and administrative barriers. (Priorities for mainstreaming Green Growth into the SAGCOT IGP are discussed in the next sub-section.) The second dimension is to prevent investment that is unlikely to provide high levels of community and national benefit, sustainability, and equitability. Ideally this is done by guiding such investors toward more desirable forms of investment.

To ensure that investment in SAGCOT is broadly beneficial and equitable, a set of principles for investment should be formulated and applied. These principles for investment serve as an outward-facing statement that the Southern Corridor is a place that attracts innovators and best-in-class businesses to invest in agriculture and ecosystems and establishes key social and environmental safeguards. For companies, abiding by national or international investment guidelines will not only provide a 'right to operate' but will also demonstrate their commitment towards the larger mission of AGG within SAGCOT. The principles will state the responsibility they take on in exchange for the public and philanthropic efforts from which they will benefit.

One possible approach would be to develop three categories for investment in the Corridor. These could include: 1) investments that are prohibited or seriously regulated due to high associated social or environmental risks, 2)

⁸ These roundtables include the Better Sugarcane Initiative (Bonsucro; www.bettersugar.org); the Round Table on Responsible Soy (www.responsiblesoy.org); the Global Roundtable for Sustainable Beef (www.sustainablelivestock.org); and the Roundtable on Sustainable Biofuels (<http://rsb.epfl.ch>).

investments that meet a set of minimal standards that would incur no social or environmental risk, or would provide compensation for minor negative impacts, and 3) ‘Green Star AGG’ investments that have major positive environmental and social, as well as economic, benefits.

The SRESA process has identified multiple issues which should be covered by the minimal standards, including issues related to equitable land access and community impacts, such as best practices related to free prior informed consent and resettlement. The guidelines could also be informed by the international Principles for Agricultural Investment that Respects Rights, Livelihoods and Resources (PRAI), and FAO’s recently agreed Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security. They could also follow the “Guidelines on Responsible Agricultural Investment” that are currently being negotiated in the Committee on World Food Security, which should be ready by 2015.

For SAGCOT, a set of ‘do no harm’ baseline investment criteria could be developed as minimal standards which would need to be met in order for any project within the corridor to move forward. The standard would require that any project not have significant negative impacts on ecosystems or communities and be consistent with village land use plans, but they need not create substantial improvement. If investments met a more ambitious set of ‘Green’ environmental and social standards, they would be eligible for additional benefits such as preferential financing and an accelerated administrative processes.

For investors with a commitment to positive social and environmental change, these “do no harm” principles would be supplemented with voluntary guidelines about the way in which agriculture, forestry, and other land-based activities are conducted to achieve AGG. Companies making major strides towards the ‘Green Star’ standards could also be acknowledged in some way. The specific elements for each, and easy-to-use metrics, require further dialogue. Earning the ‘Green Star’ could provide positive media exposure for the company, and also reinforce SAGCOT’s image for AGG. Potential ‘Green Star’ guidelines could include:

- Major business involvement of smallholder farmers (in a number proportional to the size of the enterprise) through mechanisms such as outgrower schemes, extension services, access to reliable input supplies, guaranteed product markets, or payments for ecosystem services;
- A community benefit-sharing plan that includes sharing of future revenue streams, whether through an equity stake or another mechanism
- Investment and management activities improve or restore land and water resources, increase the flow of ecosystem services, and/or reduce or sequester total greenhouse gas emissions; and
- Active collaboration with other stakeholders to address environmental challenges and social and economic opportunities in the landscape.

The process of fulfilling the principles of investment is intended to be a constructive one in which investors are educated about potential AGG practices that may simultaneously meet the criteria and enhance the enterprise’s bottom line. Already, a number of voluntary systems and management tools have been established to enable agricultural enterprises to conduct self-evaluations to identify ways in which they may increase efficiency, profit, and sustainability.⁹ Such tools could be adapted to the SAGCOT context to assist farm managers in decision-making during both the start-up and operation phases.

9 Examples of these include the Field-to-Market framework and evaluation tool (<http://www.fieldtomarket.org>), Unilever’s sustainable sourcing strategy and indicators (<http://www.unilever.com/sustainable-living/sustainablesourcing/>), the Cool Farm Tool (<http://www.coolfarmtool.org>) and the Environment and Climate Compatible Agriculture (ECCAg) agronomic protocols and assessment system currently being piloted at about a dozen farm plots in the Corridor.

*The Southern Corridor will be known as a place that attracts innovators and best-in-class businesses to invest in agriculture and ecosystems.
It will not compete in Africa's race to the bottom.*

Ideally, the minimal standards would be fully harmonized with the suggested policies outlined in the SRESA and with any existing regulations or conditions—such as Tanzania's environmental impact review process and conditions attached to the Catalytic Fund. This design would minimize unnecessary regulatory burden for investors while still requiring that they fulfill substantive criteria for responsible investment.

The minimal standards should apply to all proposed investments that exceed a threshold of land area (e.g., 200 hectares) or a corresponding anticipated annual sales figure. As such, they may apply to some projects that are not currently required to undergo environmental review. Projects that fall beneath the size threshold (including most investments by farmer associations, local Tanzanian businesses, and emergent farmers) will still be strongly encouraged to fulfill the minimal standards and even pursue 'Green Star' standards if they choose.

Along with the initial administration of principles of investment, a fair and systematic process for monitoring and enforcement of any conditions placed on specific investments must be established and adequately supported in perpetuity.

Mobilizing investment for AGG

'Investment generation' is the process of pro-actively marketing investment opportunities to prospective investors and partners. This activity is particularly important for SAGCOT, which seeks to attract concentrated volumes of investment in specific sectors and locations. In 2012, the SAGCOT Centre facilitated the process of developing an SAGCOT Investment Partnership Program, focusing initially on cereals, sugar, livestock, power, and transport as priority sectors. This program is being implemented through investor outreach by representatives of the SAGCOT Centre and GoT together with their consultants.

As noted in Chapter 4, Agriculture Green Growth provides numerous opportunities for investors to enhance profitability, reduce risk, and maintain stable relationships with local communities. Furthermore, through the mechanisms described earlier in Chapter 5, investors will be encouraged and supported to adopt AGG. These opportunities should be highlighted in the IGP in a way that fully integrates AGG into the program's core messages. Specific messages could include:

1. Through a combination of coordinated planning, investment guidelines, and AGG support, SAGCOT and its partners are taking concerted action to ensure that water supplies for agriculture remain available and reliable for the indefinite future. Such efforts reduce risk for investors in water dependent crops such as sugarcane and rice.
2. On several of the IGP target sites (particularly existing government farms and ranches) there are opportunities to dramatically increase agricultural productivity through efficient precision and agroecological farming methods.
3. New village and district planning processes and a land bank ensure a predictable, efficient process for acquiring suitable land for agricultural investment and maintaining clear, enforceable rights and obligations going forward.
4. The development of the SAGCOT 'brand' as one of sustainable, equitable, and transparent development provides a positive association for corporate imaging and branding, and reduces the risk of negative scrutiny or accusations of "land grabbing."



7. AGG vision of success: the potential

Looking ahead twenty years, we can envision three possible—and quite different—development trajectories for the Southern Corridor. Business-as-usual is a pathway of unfulfilled potential, in which rural poverty and environmental degradation continue in a vicious cycle, despite some gains resulting from current and planned investments in agriculture and rural development. A second pathway is that of agricultural intensification with prevailing practices (AIPP). Under this approach, major external investment is leveraged to expand input-intensive agriculture to greatly increase food production, with projected benefits for many smallholders, farm workers, and value chain actors. But, without specific strategies for addressing climate change, land and water optimization, and other elements of sustainable intensification, environmental impacts are likely to be severe, and could undermine the region's productive capacity. Meanwhile, benefits will bypass the majority of small-scale farmers, who will continue to use low-productivity practices with weak resilience to climate change and other shocks.

The Greenprint has proposed a third pathway: that of broad-reaching Agriculture Green Growth. A strong cadre of leaders committed to this vision already exists throughout the private, public, civic, and grassroots sectors in Tanzania. In this chapter, we quantify the benefits that could be realized if these people were fully supported—and if additional participants were encouraged and incentivized to join a broad-reaching effort to implement sustainable, agriculture-led development. The Green Growth Technical Team developed scenario models to estimate impacts on crop production, greenhouse gas emissions, water use, and deforestation under AGG as proposed in the Greenprint, compared to AIPP. These projections use data from the Blueprint, information on existing conditions in the Corridor, evidence on the impacts of AGG practices in sub-Saharan Africa and elsewhere, and Greenprint plans to estimate impacts over the next twenty years. (For additional information on how the projections were developed, please see Annex B.) These projections indicate that AGG, if implemented as proposed in the Greenprint, will provide widespread benefits for food security, economic development, environmental sustainability, and ecosystem conservation.

Impacts on food production and livelihoods

The projections examine food production for three crop categories: sugar, rice, and field crops (consisting of oilseeds, legumes, and grains other than rice). In total across the entire Corridor, the Greenprint strategy is projected to increase food production by 25 per cent compared to the AIPP scenario, by the year 2030. These gains are attributed to the increased emphasis placed on increasing the productivity of smallholders that are not involved in outgrower or block farming schemes ('unaffiliated smallholders') (see Table 7-1 and Figure 7-1). Since this group comprises the majority of farmers, farmland, and crop production in the Corridor, productivity gains among unaffiliated smallholders result in very large gains in aggregate food production. Such gains will be achieved through sustainable intensification strategies (see Chapter 4) supported by programs for extension and local organisation support (see Chapter 5) and by complementary Blueprint strategies for increasing farmer access to reliable high-quality inputs and post-harvest markets. By the year 2030, unaffiliated smallholders will produce 70 per cent more rice and field crops under the Greenprint strategy than in the AIPP scenario. This represents a gain of more than 2.2 million tons per year, worth approximately US \$600 million (936 billion TzSh) at recent market prices.

Compared to AIPP, AGG will generate the greatest gains for field crops, for which practices such as conservation agriculture and water harvesting will greatly increase per-hectare yields for smallholder farmers. In the event of increased droughts or other unfavourable conditions associated with climate change, production under all scenarios

would likely be lower, but the relative productivity gains associated with AGG could be even greater because of the increased resilience achieved by farmers. Yield gains will also be achieved for smallholder rice, based on up-scaling of System of Rice Intensification (SRI). AGG is not expected to significantly increase per-hectare yields for rice or sugarcane for commercial farms or satellite smallholders compared to AIPP. However, precision agriculture and other sustainable practices used on these crops under the AGG strategy will provide at least comparable yields while increasing input use efficiency. By optimizing use of water, fertilizer, pesticides, and energy, commercial farms and satellite smallholders will be able to reduce costs and boost profitability. They will also reduce their impact on the environment and help to sustain productivity well into the future through stewardship of water and soil resources (see Table 7-2).

By improving the productivity of unaffiliated smallholders through improved extension and producer organisation, AGG will help the SAGCOT Initiative to deliver more widespread and equitably distributed benefits. Increases in the production of staple grains (+58 per cent for field crops and +10 per cent for rice compared to the AIPP scenario) will also make important contributions to food security at the national and regional levels (Figure 7-1). Since most of these gains will be based on agroecological farming systems, farmers will also possess the knowledge and technology to adapt their cropping practices over time in response to climatic, environmental, or market changes. Complementary strategies proposed in the Blueprint, such as improving access to high-quality seeds, other inputs, and weather insurance, will also be critical for improving farmers' resilience.

As more smallholders generate crop surpluses, many will partially or fully move out of subsistence farming. Farmer associations and local enterprises will play an important role in supporting value addition and marketing to enable farmers to benefit from these increases in productivity. As per-area yields increase, pressure on forests from the expansion of subsistence agriculture will decline: more farm households will be able to feed their families on existing plots, opportunities for farm profitability and value addition will grow, some subsistence farmers will move into other lines of work, and the relative economic appeal of opening up new subsistence plots on marginal land will diminish.

By improving productivity for unaffiliated smallholders, the Greenprint strategy will greatly expand the reach of the poverty alleviation benefits provided by the SAGCOT Initiative. By 2030, at least 40 per cent of smallholder households (about 640,000 households) are projected to adopt AGG practices on their individual plots, while additional rural residents will benefit from association with commercial hub farms. Based on currently achievable yields—even under low-input conditions—the majority of households that adopt AGG practices are expected to become food secure, and most will have marketable surpluses. The development of more integrated value chains will not only benefit farmers, but also create significant employment opportunities. In sum, the investments described in this Greenprint and in the Blueprint will benefit in excess of one million households containing a total of more than five million persons.

Impacts on environment and natural resources

In addition to increasing food production, AGG will reduce the negative environmental impacts of agriculture in the Southern Corridor. By doing so, the Greenprint strategy will reduce conflict among communities and sectors (e.g., for limited land and water resources) while increasing the total economic benefits realized from the region's land and water resources.

The impact projections estimate the potential effects of the AGG strategy (relative to the AIPP scenario) on three key factors: deforestation, net greenhouse gas emissions, and water use. The model considers only the impacts of agricultural practices on these factors. However, other components of the AGG strategy (such as community forestry and energy efficiency) could have additional benefits for conserving forests and reducing greenhouse gas emissions.

Table 7-1. Projected crop production.

The table provides total food production estimates for the AGG and AIPP scenarios. Sub-table (a) provides estimates for total production of sugar, rice, and field crops, in five-year increments through 2030. Sub-table (b) allocates production according to producer group. In this table, “Satellite Smallholders” refer to small-scale farmers affiliated with commercial farm hubs through outgrower schemes, block farming, or contract farming arrangements. “Unaffiliated Smallholders” refer to small-scale farmers who do not have a relationship with a commercial hub (but may be involved in a local farmer association, marketing cooperative, or similar entity). Production estimates are in thousands of metric tons.

(a)	AIPP Estimates ('000 t)				AGG Estimates ('000 t)			
Crops	Year 3	Year 8	Year 13	Year 18	Year 3	Year 8	Year 13	Year 18
Sugar (cane)	240	1,380	2,904	4,297	241	1,308	2,904	4,297
Rice	744	855	1,273	1,444	747	891	1,396	1,717
Field Crops	1,935	2,394	2,698	3,114	1,974	2,609	3,398	5,075
Total	2,919	4,629	6,874	8,855	2,961	4,881	7,698	11,089

(b)	AIPP Estimates ('000 t)				AGG Estimates ('000 t)			
Producer Group	Year 3	Year 8	Year 13	Year 18	Year 3	Year 8	Year 13	Year 18
Large commercial	145	1,056	2,277	2,864	145	1,056	2,277	2,864
Satellite smallholder	264	890	1,614	2,803	264	890	1,614	2,803
Unaffiliated smallholders	2,511	2,683	2,983	3,188	2,552	2,935	3,807	5,422
Total	2,919	4,629	6,874	8,855	2,961	4,881	7,698	11,089

Without AGG, continued low productivity on unaffiliated smallholder farms, combined with population growth, will push farming households to convert more land for subsistence agriculture. In the AIPP scenario, agricultural land use in the Corridor will expand by 25 per cent in the next twenty years, resulting in deforestation and the conversion of more than 500,000 hectares of Miombo woodland, highland forests and savannahs. Under AGG, some conversion for subsistence agriculture will still occur—particularly in the first ten years—but the progressive roll-out of extension programs and other support for smallholder sustainable intensification will result in only 11 per cent total agricultural land expansion over the 20-year period, preventing 300,000 hectares of land from being deforested or converted (Figure 7-2). In addition, as marginal farmlands become uneconomic relative to newly productive smallholder farms, AGG could result in the abandonment of at least 18,000 hectares of existing marginal farmland, which could potentially be available for ecological restoration. Under both scenarios, new commercial farms identified in the Blueprint are assumed to occupy primarily existing agricultural lands. Under AGG, wildlife corridors of natural habitat and compatible land uses are assumed to be protected and re-connected.

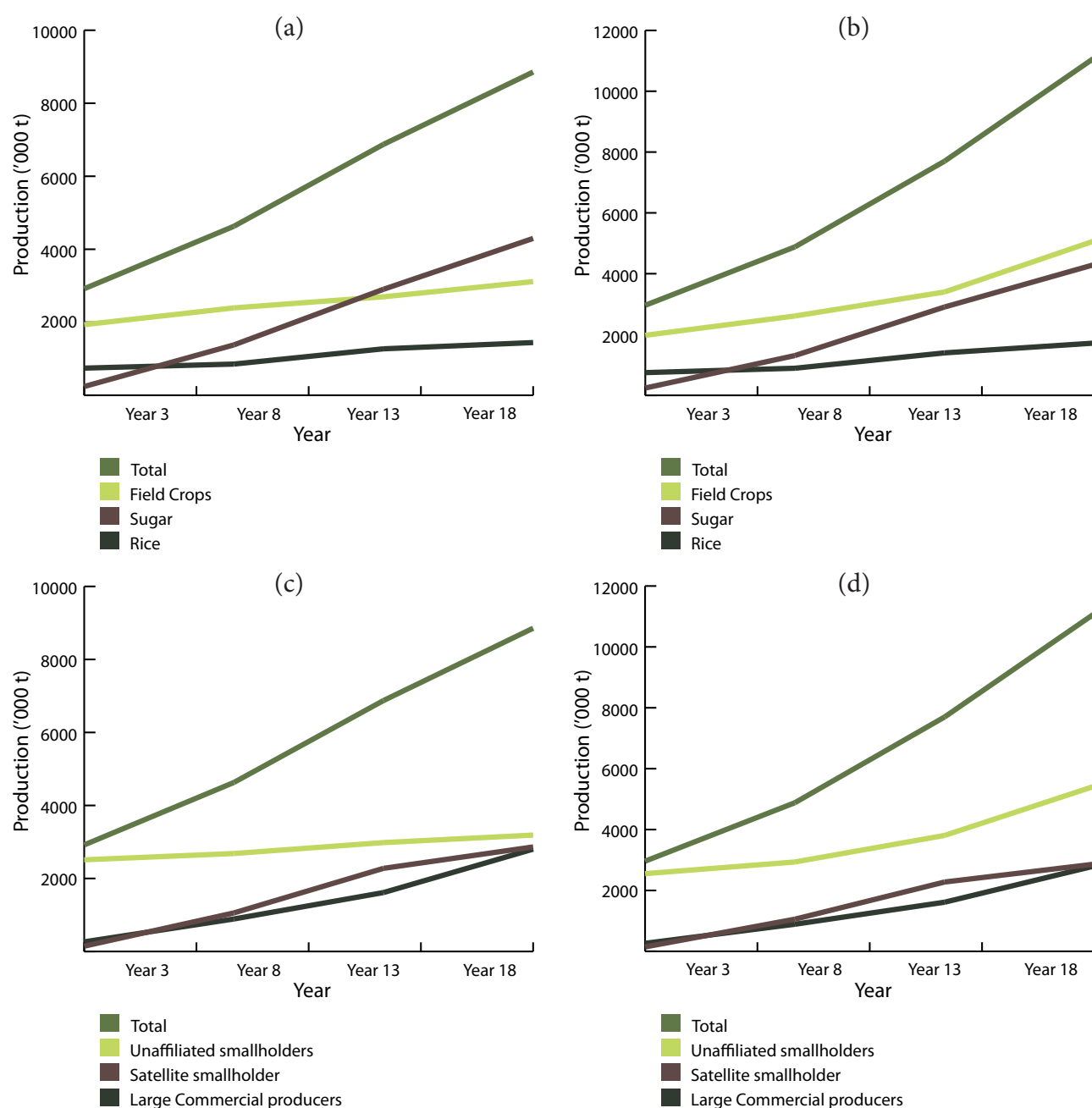


Figure 7-1. Projected crop production.

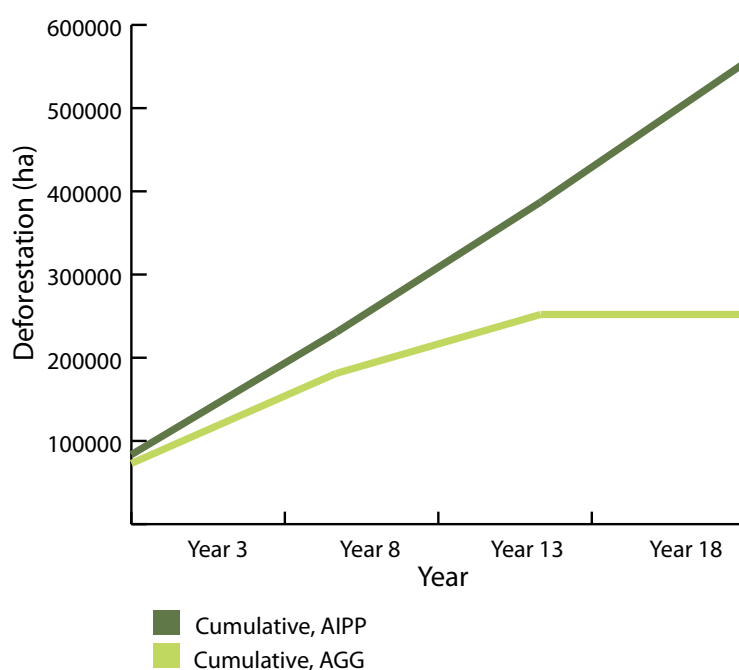
The figures compare changes in annual crop production in Year 3, Year 8, Year 13, and Year 18 for AGG versus the AIPP strategy. Figures (a) and (b) compare crop production by crop under AIPP (a) and AGG (b). Figures (c) and (d) compare crop production by producer group under AIPP (c) and AGG (d).

Over a 20-year period, the AGG strategy will result in a net reduction of greenhouse gas (GHG) emissions totalling nearly 30 million tons CO₂-equivalent, worth almost US \$300 million at recent carbon prices of \$10 per ton of CO₂-equivalent (Table 7-2 and Figure 7-3). More than 90 per cent of these reductions are associated with avoided deforestation, while the remainder results from increased soil carbon and avoided emissions from agricultural practices. Avoided GHG associated with sustainable intensification of rice and livestock production, from improved energy efficiency and from climate-smart infrastructure design and development were not included in the model, due to data uncertainties, but could significantly increase these estimates. The anticipated emissions

Table 7-2. Projected environmental benefits of AGG.

The table indicates projections for avoided deforestation, climate change mitigation, and water savings associated with AGG compared to agricultural development under the original Blueprint strategy.

Environmental benefit	Year 3	Year 8	Year 13	Year 18
Avoided deforestation (hectares)	10,519	49,180	135,146	302,766
Annual mitigation potential from agricultural practices (tons CO ₂ -equivalent per year)	14,866	65,012	175,702	419,374
Cumulative mitigation potential from agricultural practices (total tons CO ₂ -equivalent as of each date)	14,866	139,344	575,094	1,697,275
Cumulative mitigation potential from avoided deforestation (total tons CO ₂ -equivalent as of each date)	922,659	4,313,754	11,854,023	26,556,514
Cumulative mitigation potential from all sources (total tons CO ₂ -equivalent as of each date)	937,526	4,453,098	12,429,117	28,253,789
Water savings (’000 cubic meters per year)	14,029	109,483	342,000	941,715

**Figure 7-2.** Projected deforestation outcomes.

The figure indicates cumulative deforestation attributable to agricultural expansion within the Southern Corridor under the AIPP (agricultural intensification with prevailing practices) and AGG (Agriculture Green Growth) scenarios. These estimates do not include deforestation attributable to charcoal production, logging, or other causes.

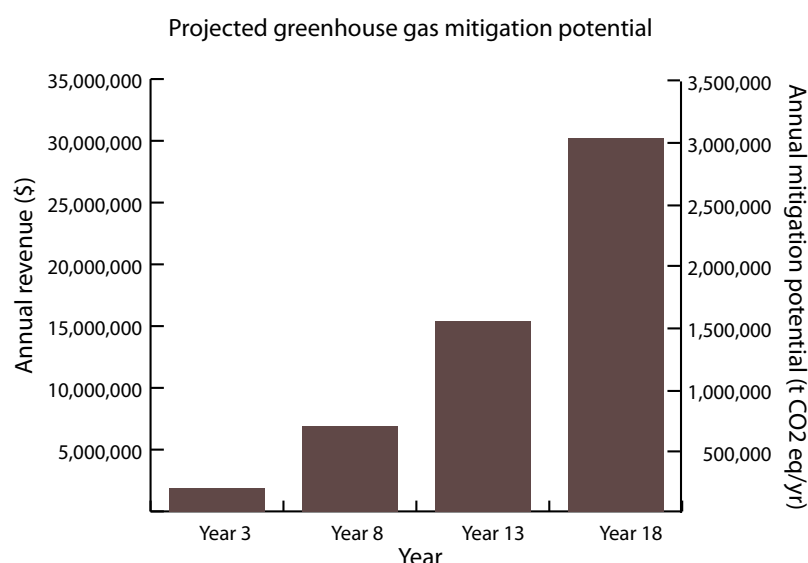


Figure 7-3. Projected greenhouse gas mitigation potential of the AGG strategy. Total mitigation potential has been calculated by summing the CO₂-equivalent value for all relevant greenhouse gases. The potential monetary value of carbon credits associated with these mitigation outcomes is calculated on the basis of recent carbon prices of US \$10 per ton of CO₂-equivalent (t CO₂-eq).

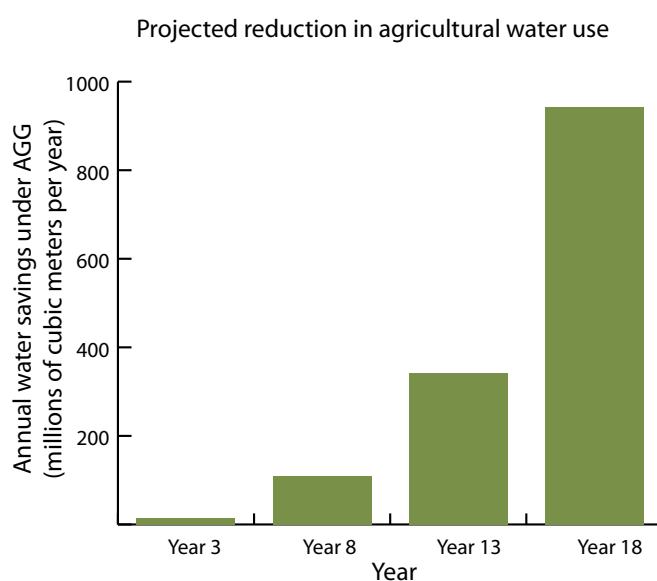


Figure 7-4. Projected reduction in agricultural water usage. The figure indicates the estimated annual reduction in irrigation water usage under the AGG (Agriculture Green Growth) scenario compared to the AIPP (agricultural intensification with prevailing practices) scenario.

reductions from AGG could open the door to new financing from international carbon markets and REDD+ financing mechanisms.

The AGG strategy will also generate annual water savings of about 940 million cubic meters (760,000 acre-feet) per year on irrigated land (Table 7-2 and Figure 7-4). More water-efficient farmers will have lower costs and reduced susceptibility to climatic variability. In addition, precious water resources will be conserved for ‘environmental flows’ (i.e., keeping water in streams to support wildlife habitat and other downstream uses) and to supply hydroelectricity facilities at the Mtera, Kidatu, and other key dams.

An inspired vision, a practical strategy

The SAGCOT Initiative offers an inspired vision of what could happen if farmers, communities, investors, government, and civil society come together to tackle the challenges of food security, poverty, environmental degradation, and climate change in southern Tanzania. Taken together, the SAGCOT Blueprint and this Greenprint lay out a practical strategy—and an attainable investment programme—to realize this vision.

The development projections summarized above offer a glimpse at what Agriculture Green Growth could achieve by the year 2030. The projections indicate that well-planned and coordinated investment, together with robust support for farmers and rural communities to sustainably intensify agriculture with appropriate technologies and practices, can simultaneously reduce poverty, ensure food security, and conserve Tanzania's ecosystems and natural resource base. It can capture new synergies between sectors, communities, and businesses that once worked separately, or at cross purposes. If Tanzania commits to making the Southern Corridor a fertile ground for Agriculture Green Growth, millions of people will reap the benefits.



8. Next steps

The next two years will be a pivotal period to jump-start and build momentum for the AGG approach in the Southern Corridor. This final chapter identifies specific actions that the SAGCOT Centre and partners can take to establish this momentum and lay the foundation for scaling up AGG investments in the region. The proposed actions fall into four categories:

1. Engage key national and local stakeholders in dialogue about AGG;
2. Strengthen and demonstrate integrated planning;
3. Catalyse investment in AGG;
4. Strengthen the knowledge base for AGG in the Southern Corridor.

Engage key national and local stakeholders in catalysing AGG

The SAGCOT Centre and partners have a unique opportunity to create a culture of AGG knowledge and practice that engages key actors and establishes key organizations that can catalyse widespread uptake. To do so will require a concerted outreach program over the next 12-18 months that does four things:

- Shares tangible and compelling messages about AGG and its potential benefits with all relevant stakeholders;
- Invites stakeholders to help refine the AGG strategy based on their own knowledge and experience;
- Recruits a cadre of local, national and international champions of the AGG approach that can ‘fan out’ to disseminate key messages to their own colleagues and networks; and
- Develops a strategy for high-level ‘headline’ events and messages that highlight AGG as an innovative component of the SAGCOT strategy and of Tanzania’s bid to create the world’s first sustainable agricultural development corridor.

To implement this outreach program, the SAGCOT Centre could produce a set of materials targeted to farmers and communities, businesses, international investors, and government officials at all levels, that explains the rationale for AGG and illustrates key strategies and investment options. While AGG practices and benefits are not especially difficult to understand, they may be new to many target audiences. Accordingly, the outreach program should use visually oriented messages and multiple outreach media, and include training and briefing for journalists to develop engaging stories around innovative AGG leaders, businesses, and impacts. The Agriculture Green Growth Portal (www.AgricultureGreenGrowth.com) can serve as a home for the full set of outreach materials, while providing additional practical guidance and regular updates for those who are ready to learn more and implement AGG.

A corresponding activity for engaging stakeholders in the capitol, the Clusters, and throughout the Corridor in catalysing broad-based interest and support for AGG, is to conduct a series of dialogues. The dialogues could follow in the vein of the SAGCOT Green Growth Leaders Workshop in May 2012, which would bring together stakeholders to develop more detailed AGG strategies for Clusters and investment target areas. One such workshop would convene high-level government agencies to discuss inter-ministerial coordination. Another would focus on building awareness and appreciation for innovative ways that water resource planning, management and use-efficiency can be pursued, and conflicts addressed, employing a green growth approach.

Strengthen and demonstrate integrated planning

Implementation of the AGG vision should begin immediately in priority Clusters. Until practical implementation of the approach is under way, AGG risks being viewed as a concept only and therefore not worthy of serious consideration by investors. Furthermore, there is a certain amount of ‘path dependency’ in any economic development program: if AGG planning processes and investments are espoused from the outset, it will become easier to leverage additional AGG investment going forward.

To begin, the SAGCOT Centre should work with its key partners to select one or more of the priority Clusters (Ihemi, Mbarali, or Kilombero) for immediate implementation of the integrated AGG Cluster planning process described in Chapter 5. This process would get underway in 2013, and likely result in a fully functioning land bank within a year after that. By 2014, the planning process can be expanded to additional clusters, adapting it as appropriate based on experience from the first pilot clusters. Planning work in the first cluster could be co-financed through bilateral funding from a donor associated with the Green Reference Group, but also strongly leverage existing planning capacity.

To support the integrated planning process, it will be critical to set up a SAGCOT data and analysis facility for maintaining and using information on agriculture, environment, poverty, and economic development—and from ensuring that such important data do not remain siloed in different institutions and sectors. This facility would include a strong component of spatial data, with technical expertise to run geographic information systems (GIS). Additionally, a cadre of professional planning facilitators will be needed to run district and village planning processes. There are already many such professionals working throughout the Corridor, but additional training and backstopping in integrated planning for AGG will help ensure a rational and participatory set of planning processes.

As a first step, integrated planning in each cluster could begin with a cluster-focused AGG workshop, drawing approximately 50 people from critical stakeholder groups in the cluster. The cluster analysis maps created for this Greenprint may be used and adapted to help facilitate dialogue and decision-making at such workshops. These workshops could follow with a pilot initiative in one or two Clusters to develop a process for streamlining integrated land use planning and allocation. A corresponding initiative could follow to develop processes for integrating conservation corridor planning into land use planning in priority Clusters for AGG investment.

Catalyse investment in Agriculture Green Growth

One important way to kick-start interest in AGG is to launch a few successful projects that can serve as tangible examples or demonstration sites for future investors. To do so, the SAGCOT Centre and its partners should identify 3–4 ready-to-go AGG projects in the Corridor that can increase food production, farmer income and/or investor profitability in a short time period. These ‘quick wins’ could potentially be supported by the Catalytic Fund, once that becomes operational, but could also be of interest to private or civic sector investors. Several candidate AGG projects are highlighted throughout the Greenprint, including investment in smallholder conservation agriculture or system of rice intensification; co-financing to help commercial farms invest in precision agriculture machinery and systems; intensification of livestock production and processing on one of the Corridor’s NARCO ranches; and investment in community forestry enterprises yield multiple revenue streams. Catalytic Fund resources could also assist in opening new marketing channels explicitly linked to AGG, such as expansion of eco-certification for tea, coffee, fruits and vegetables; and development of agro-ecotourism business in areas where agricultural production abuts traditional tourist attractions.

Another important early step for the SAGCOT Centre is to link with other Tanzanian institutions, such as the Tanzania Investment Bank, to set up a locally led AGG Finance Pipeline. This activity should be aligned with the

SAGCOT Investment Partnership Program, which is also working to identify ripe investment opportunities and market these to investors.

To bring in socially and environmentally responsible investors who will be interested in investments that follow the Greenprint concept, SAGCOT will need an aggressive strategy to identify, inform and attract them to the region. These efforts should be incorporated into the SAGCOT Investment Partnership Program already underway. Four short-term activities are recommended, to be woven into the broader IGP as appropriate:

First, SAGCOT can engage business communications professionals to develop materials for marketing the AGG strategy and specific investment opportunities to potential business and financial investors. These materials should specify support available for AGG, relevant aspects of the policy environment, specific sites and opportunities available for AGG development, and the expected standards for AGG.

A “roadshow” on AGG could be organized for representatives of the GoT, SAGCOT Centre and/or Tanzanian business leaders in the Corridor to meet with impact investors, sustainable investment funds, and agricultural and forestry companies in Europe, North America, Brazil and elsewhere, whom research has identified to be especially promising. The “roadshow” could be kicked off by an AGG trade fair that brings together domestic and foreign companies with public and civic organizations to showcase AGG technologies and institutional innovation, and to help catalyse new partnerships. A workshop on financing AGG investments can be convened for Tanzania-based banks, investment groups and businesses to showcase opportunities to scale up successful businesses in the Corridor. SAGCOT can recommend actions needed for Tanzania and SAGCOT to be fully compliant with the recently-adopted FAO voluntary guidelines on agriculture investment, and advertise with potential investors.

SAGCOT can also help to develop a pipeline of investable smallholder-based AGG projects and businesses, in collaboration with impact and other private investors to build the institutional capacity over 2-3 years for villages and farmer organizations to be ‘investment-ready.’ This process could be supported by initiating a program of small grants and loans designed to stimulate business planning and investments in AGG opportunities.

Finally, SAGCOT partners can engage policy leaders in assessing needs and opportunities for policy change that would help to foster investment in AGG. Policy makers at all levels will benefit from forums that enable them to deliberately consider ways they can forge the cross-sectoral ties between agriculture, water, environment, transportation, energy, social development, planning, education and related sectors that will be needed to enable and promote a green growth approach to agriculture development in the Corridor.

Strengthen the knowledge base for AGG

To fully realize the potential of AGG in the Southern Corridor, agricultural production systems, natural resource management systems and market development will require a strong knowledge and evidence base, and improved capacities to access and use expanding knowledge and information. AGG will require a broadly distributed knowledge base among farmers, land and water planners, investors, policy makers and others; therefore capacity development and knowledge generation activity must coincide.

This will require bringing together existing information in a usable form, answering strategic questions about farm and landscape management, and extracting lessons from experience throughout the Corridor to continually improve options for increasing the productivity and profitability of agriculture and forestry, with benefits for communities, the environment and the climate. Over the next two years, work should be commissioned to begin developing and utilizing this knowledge.

Most fundamental would be to pilot the development of an AGG Extension curriculum and delivery system that will stimulate farmers and other local land managers to contribute their experiential knowledge to the growing AGG knowledge base, while also building capacities to manage new technologies and practices and to profit from them.

Interested stakeholders can explore the potential demand and development options for eco-friendly and climate-friendly product labelling for SAGCOT AGG producers and businesses. In particular, there is enthusiasm to explore strategies for developing eco-standards for rice in the region. This could begin with pilot development and testing in one or two Clusters where rice is a prominent crop.

More detailed Opportunity Analyses can be developed for the AGG opportunities presented in this framework document. An AGG Finance Pipeline should be developed, with emphasis on the investment portfolio and due diligence work of the Tanzania Investment Bank.

Detailed analysis is needed of the types of hydrologic and watershed management that can ensure adequate water availability for wildlife habitat, tourism and domestic uses, as well as sustain water flows for irrigation. Analyses are also needed to spatially target AGG investments where they are most needed and stand to deliver the greatest economic and ecological benefits. A system can be developed to track change in the Corridor across multiple landscape dimensions (sustainable productivity, ecological integrity, livelihood security, institutional capacity), including tracking the benefits of AGG for climate change resilience and mitigation. As the AGG strategy and implementation plans become operationalized, SAGCOT partners should consider developing an evaluation framework and methodology that can be used to motivate and sustain multi-stakeholder engagement in the Corridor and individual Clusters.

Finally, SAGCOT should mobilize research in the region to support AGG, tapping the considerable agricultural, environmental and development research underway in the country by universities and research institutes that can provide technical input into design of investments and address knowledge gaps and challenges for implementation. Two immediate steps should involve: 1) organizing a workshop with Tanzanian researchers to inventory relevant research already produced and underway, and identify priority areas for supporting on-the-ground investments or analysing ways to strengthen investment plans; and 2) facilitating a meeting of representatives of the Consultative Group on International Agricultural Research (CGIAR) centres in Tanzania and East Africa, and of leaders of the global Landscapes for People, Food and Nature (LPFN) initiative, to set up 'sentinel site' landscapes and 'focal learning landscapes' within selected Clusters to conduct monitoring and research that directly supports SAGCOT farmers, agribusiness and land managers.

The foregoing actions will make a significant contribution toward realizing the inspired vision of the SAGCOT initiative to tackle the challenges of food security, poverty, environmental degradation, and climate change in southern Tanzania. By engaging key national and local stakeholders in catalyzing AGG, strengthening and demonstrating integrated planning, catalyzing investment in AGG, and strengthening the knowledge base for AGG, critical steps will be taken toward operationalizing the practical strategy and attainable investment programme that are laid out by the SAGCOT Blueprint and this Greenprint, together.

Annex A: Glossary

- Agriculture Green Growth:** An approach for attracting and coordinating investment in agricultural production, processing and distribution that is efficient, profitable, sustainable and resilient to climate change.
- Block farming:** A farming system in which groups of smallholder farmers join together to farm large tracts under the guidance of a technical supervisor in order to minimize labour, input and extension costs.
- Climate-smart agriculture:** An approach to food production that sustainably improves productivity, increases resilience, and reduces net greenhouse gas emissions while enhancing the achievement of national food security and development goals.
- Conservation agriculture:** A farming approach that manages soils, cropping cycles, crop residues, and other natural resources to increase yields, improve soil health and reduce environmental impact. The system includes three core practices: 1) minimizing tillage and other soil disturbance, 2) maintaining permanent soil cover, and 3) diversifying crop rotations. Conservation agriculture is used for a wide variety of the crops including maize, sunflower, beans, peas, sorghum, and vegetables. It can be readily adapted to both small- and large-scale farms.
- Green Economy:** Economic development that improves human well-being and social equity while reducing environmental risks and scarcities. As a contemporary form of sustainable development, the green economy recognizes the monetary and non-monetary values of ecosystems for human well-being, and incorporates these values into strategic decision-making. A green economy also emphasizes the importance of resource use efficiency, reduced carbon emissions, and inclusive growth benefitting all sectors of society.
- Green Growth:** A development model that links economic growth and human wellbeing in all sectors (food production, energy, water, transport, housing, etc.) to sustainable resource management. The concept is similar to Green Economy.
- Integrated Landscape Management:** Approaches or strategies for achieving multiple objectives related to agricultural production, ecosystem conservation and sustainable natural resource management, and human health and well-being across a landscape by strengthening institutions and supporting collaborative, multi-stakeholder management processes.
- Outgrower scheme:** A system under which small-scale farmers (outgrowers) produce crops for sale to a specific purchaser, usually an agricultural processing operation or nearby large-scale farm. Frequently, the outgrowers receive training, extension, and input supplies to help improve product quantity and quality.
- Precision agriculture:** A farm management approach that monitors and manages variability within crop fields or animal herds in order to apply the optimal quantity of inputs at the optimal locations and times. By doing so, farmers using precision agriculture can often achieve comparable or greater yields with fewer inputs, thus improving production efficiency and profitability while reducing environmental impacts. Precision agriculture generally uses modern technologies such as sensors, enhanced machinery, and geographic information systems to provide optimal management.
- SAGCOT:** The acronym SAGCOT is used in this report to refer to the SAGCOT Initiative. The geographic area defined as the Southern Agricultural Growth Corridor of Tanzania is referred to as the “Southern Corridor.”
- System of Rice Intensification:** A farming system for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients. Compared to conventional rice cultivation, SRI methods reduce the applications of water so that fields are intermittently but not continuously flooded; reduce seed densities; apply systematic seedling spacing; and reduces the usage of chemical fertilizers and pesticides while increasing soil organic matter.
- Sustainable intensification:** A broad term referring to strategies that increase the amount of food produced per unit of land, but without negatively affecting the environment or natural resource base. Whereas conventional strategies intensify agriculture by applying more chemical fertilizer, pesticides, water, and energy, sustainable intensification does so mainly by improving input use efficiency and promoting ecological processes (e.g., nutrient cycling, soil fertility, water harvesting, pest control, and pollination) that increase the biotic and abiotic productivity of the farm. Sustainable intensification can combine these ecologically-based practices with judicious use of modern technologies and practices, including agrochemicals, hybrid or genetically modified seeds, and modern farm machinery.

Annex B: AGG development impact calculations

This Annex provides additional detail on the AGG development projections presented in Chapter 7. These projections are based on a model created by the Green Growth Technical Team to predict the effects, over the next twenty years, of implementing the AGG strategy in this Greenprint. Of course, no model is capable of precisely predicting the future, and there are many unknown factors that will affect the future of the Southern Corridor. Nevertheless, the model is a helpful tool for understanding, in general terms, the likely impacts of AGG versus other development trajectories that the Southern Corridor could follow.

Factors for estimating SAGCOT development program impacts

The impact of mainstreaming AGG in the Corridor will depend on a range of factors. The model considers the impact of land use and management changes attributable to the AGG strategy itself, as well as ongoing trends such as population growth and other development plans, including those identified in the Blueprint. The model compares development outcomes under two contrasting scenarios. One scenario is based on a development strategy that implements agricultural intensification with prevailing practices (AIPP), including input-intensive agriculture without explicit environmental management at farm and landscape scales. The magnitude of agricultural expansion and intensification under this scenario is generally based on projections provided in the SAGCOT Blueprint. The AGG scenario describes a development trajectory that begins with the same prevailing practices but progressively incorporates sustainable intensification practices as described in the Greenprint. The model focuses on three sets of food crops: 1) rice; 2) sugarcane; and 3) field crops (consisting of oilseeds, legumes and grains other than rice). These crops were chosen because they are important commercial and/or food security crops, have data available from the national agricultural census, are targeted for development by the SAGCOT initiative, and are the focus of sustainable intensification practices in the AGG strategy (e.g., conservation agriculture, SRI and precision agriculture).

The model contains three sets of modules. The input modules provide data on existing conditions, trends, and assumptions, from the best available information sources. As part of the input component, a 'background trends' module considers population trends and dynamics, including population growth in the Corridor as well as regional patterns rural-urban migration in order to understand the dynamics of food provision to a growing population in the context of mixed production for subsistence use and market supply. The next sub-section describes some additional key inputs. The calculation modules combine information from the input modules using formulas that multiply per-area impacts by estimated scale-up trajectories for various AGG and conventional practices. These modules also incorporate certain feedbacks, such as the effects on smallholders of moving from food-insecure to food-secure status due to sustainable intensification. Finally, the output modules reports estimated impacts for food production, agricultural expansion, deforestation, water saving, and avoided carbon emissions under the two production scenarios.

Model inputs

The data and assumptions used in the model came from four main sources: 1) the development targets outlined in the Blueprint, which were to inform the creation of the AIPP scenario; 2) national agricultural census data on crop areas and yields; 3) estimates of the roll-out trajectory of AGG practices, based on information provided in Chapter 5; and 4) current peer-reviewed scientific literature on the impacts of AGG practices on yield and ecosystem services. The assumptions included in the model are generally conservative with respect to the benefits that could be provided by AGG. For example, the model assumes that commercial producers and their associated

outgrowers would not be responsible for significant deforestation or encroaching into protected areas. The Blueprint's calculations were used to estimate the growth of large scale commercial producers and outgrowers. Regarding potential yields under the two scenarios, we examined yields achieved in similar systems in countries that have experienced rapid agricultural development, such as Brazil and part of Southeast Asia. When possible, data on the agricultural systems were gathered directly from producers or scientific literature from the Corridor itself. Estimates of population growth rates and migration trends affecting the Corridor's population growth are both based on national reports.

Impact pathways

An important intermediate step in the model calculations was to estimate the land area under each type of production system (AIPP vs. AGG), for each type of cropping system and for each of three types of farmers (large commercial farms, affiliated smallholders, and unaffiliated smallholders). Each permutation of these categories had different estimated impacts on yield and ecosystem services. Land area estimates were calculated in five-year increments (five, ten, fifteen, and twenty years following program initiation). At each time step, land areas are updated. Yield estimates are treated dynamically depending on which systems and technologies are being used at a given point in time and how experienced producers are with implementing the systems. As yields change, the land area under production is subject to feedbacks. Some low-yielding fields on marginal lands are abandoned, reducing pressure for the expansion of subsistence production, but large-scale commercial agriculture expands in area to take over some previously subsistence areas. The model iterates the production calculations with the new areas until the end of the model projection period after 20 years.

The water savings and avoided greenhouse gas emissions calculations are also based on land areas, combined with inputs on water use efficiency and net greenhouse gas emissions of AIPP vs. AGG. The area of avoided deforestation for the AGG scenario is derived from land use change calculations. Such calculations assume that subsistence farmers who have low yields and do not adopt AGG will continue to convert woodlands, savannas and some forest to cropland to meet subsistence needs for the growing population. Under AGG, smallholders who achieve food security through AGG (even with population growth) are not driven to clear more land; some remain as subsistence farmers on their existing plots, some become commercial farmers, and some leave agriculture to pursue other opportunities. Using the land area of avoided deforestation attributable to AGG, the model calculates the climate mitigation potential of avoided deforestation based on carbon stocks in standing forests, woodlands, and brushlands.

Opportunities for refining the model

The model uses data and assumptions from the most reliable available sources. However, few of the data came directly from measurements taken in the Corridor, and, even where they do, it must be recognized that the Corridor is highly heterogeneous. Thus, the model should be considered as a first-order approximation of the impacts of the two alternative development trajectories. As with any model, there are always opportunities for refinement, and it is recommended that the SAGCOT Centre and its partners continue to improve the model, based on new and additional data, so that becomes an ever-better decision support tool. Below are some key areas in which the model might be refined in future iterations.

First, due to the lack of experience with sustainable intensification in the Corridor, it is difficult to predict whether SAGCOT producers will experience changes in yields and ecosystem services comparable to those seen in other countries. As more data on the impacts of AGG become available from trials and initial implementation in different parts of the Corridor, these data may be used as input parameters. Second, the model does not consider the effects of shifting from a single harvest per year to two harvests per year under intensified irrigation agriculture. While this omission does not materially affect the relative difference between the AGG and AIPP scenarios, it might affect the absolute numbers estimated for yield. Third, the model could incorporate additional modules

to provide greater sensitivity to other production factors including the incidence of extreme weather events, crop rotation, and the relative productivity of different land classes under various production systems. Fourth, the lack of data on livestock production in the Corridor prevented us from being able to include credible calculations for that sector. Incorporating livestock in future versions would be helpful. Finally, economic calculations and livelihood impacts are absent from the model, although impacts may be inferred roughly from the yield estimates. Pairing the production projections with market projections could provide valuable insight into the economic impacts of AGG on the return on investment for large scale producers and on rural livelihoods for outgrowers and unaffiliated smallholders.

The development of the SAGCOT Framework for Agriculture Green Growth was led by a team from EcoAgriculture Partners, reporting to the SAGCOT Centre and the Green Growth Reference Group.

About EcoAgriculture Partners

EcoAgriculture Partners is a non-governmental organisation that works internationally to support the integrated management of rural landscapes to simultaneously improve rural livelihoods, sustainably produce food and fiber, and conserve healthy ecosystems. The organisation does so by providing training, research, policy solutions, and support to farmers, communities and organisations at the local, national and international levels.

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About the SAGCOT Centre

The SAGCOT Centre seeks to improve the economic performance of the Tanzanian agricultural sector and secure a place for Tanzania farmers in global value chains by coordinating, supporting and facilitating activities in the Southern Corridor and fostering an environment where innovation can thrive and dedicated leaders can make a real difference.

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