CCAFS Rwanda Deep Dive Assessment of Climate-Smart Agriculture (CSA) in the USAID Feed the Future Portfolio in Rwanda

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1. Objective

USAID are working with the Climate Change and Food Security (CCAFS) program of the CGIAR to better understand the extent to which the Feed the Future portfolio may already have Climate Smart Agriculture (CSA) components, even if they are not framed as such, and to determine where opportunities for mainstreaming CSA exist. While climate has always been a cross-cutting theme in Feed the Future, BFS is now interested in framing this cross cutting theme as CSA.

CSA is an integrative approach that aims to address the linked challenges of climate change and food security. CSA refers to an improved agricultural system that is developed and implemented with three main objectives:

1. Sustainably increase agricultural productivity and incomes;
2. Adapting and building resilience to climate change
3. Reducing and/or removing greenhouse gas emissions, where appropriate

As part of a global effort that will inform how Feed the Future tracks CSA across the 19 focus countries (plus aligned) the CCAFS and USAID/BFS team selected five to carry out a deeper analysis of their portfolio. A visit in June 2015 by CCAFS to the Rwanda Mission highlighted the importance of addressing the effects of climate change in the agricultural sector and the current and potential benefits of CSA in Feed the Future. The five-day visit included a number of meetings with USAID Mission staff, Feed the Future implementing partners, Government of Rwanda partners, and other stakeholders, as well as a field trip to one Feed the Future project in the Southern Region. The process also included a review of documentation on the five current projects in the Feed the Future portfolio, shared in advance of the visit by USAID Rwanda staff. This report outlines the key findings of the visit and highlights some ways in which CSA can be further incorporated into the Mission's future programming.

Five Feed the Future countries were visited for such an analysis and these were chosen based on a program-wide survey sent to all 19 countries. The survey gave an overview of each Mission's current and potential climate smart activities. This is a case study to inform a larger effort on behalf of Feed the Future to determine entry points to further incorporate CSA into its programming, in addition to providing feedback to the Mission.

> *"The overall aim of climate-smart agriculture is to support efforts from the local to global levels for sustainably using agricultural systems to achieve food and nutrition security for all people at all times, integrating necessary adaptation and capturing potential mitigation."*
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> Lipper et al., Nature Climate Change (2014), 24 authors from 15 institutions

2. Rwandan Context

Feed the Future is working with local communities in Rwanda to help increase productivity, incomes and nutritional outcomes in a country where 80% of the population rely on the agricultural sector for their

livelihoods. In Rwanda, Feed the Future investments have focused on four outcome areas, namely improvements in the maize, beans and dairy value chains, and progress toward a minimal acceptable diet.

A. Risk and Vulnerability

Rwanda's primary climate risks are related to increasing rainfall variability, including both heavy rainfall events and flooding and recurrent droughts, although higher temperatures may affect its most important export crops (coffee and tea). While climate risks *per se* are less severe than lower elevation arid and semi-arid zones in East Africa due to the country's generally good rainfall, short dry periods and more moderate temperatures due to its elevation, *Rwanda's overall vulnerability should be seen as very high, due to its heavy dependence on rain-fed agriculture, high population density, small average landholding size, mountainous topography, and resulting degradation of/pressure on the country's natural resource base.* This leaves Rwandans farmers with a low adaptive capacity and very little margin for error in the event of future climate impacts.

> *"Rwanda is currently highly vulnerable to climate change as it is strongly reliant on rain-fed agriculture both for rural livelihoods and exports of tea and coffee. It also depends on hydropower for half of its electricity generation, a driver of economic growth. Rwanda has experienced a temperature increase of 1.4°C since 1970, higher than the global average, and can expect an increase in temperature of up to 2.5°C by the 2050s from 1970. Rainfall is highly variable in Rwanda but average annual rainfall may increase by up to 20% by the 2050s from 1970. Projections for East Africa over Rwanda and Burundi show an increasing trend in rainfall intensity for both rainy seasons which is likely to cause floods and storms which can result in landslides, crop losses, health risks and damage to infrastructure."*
> Government of Rwanda National Strategy for Climate Change and Low Carbon Development

B. Government of Rwanda (GOR) Strategy and Policy Context

The Government of Rwanda has clear strategies and priorities, which are directly translated into major program initiatives and budgets. Agriculture is no exception in this regard, and GOR program priorities reflect a strong CSA perspective. CSA offers an attractive framing for a country that needs to intensify small holding agriculture (0.3-0.5Ha), with the entry point of efficient use of limited resources. While overall greenhouse gas (GHG) emissions are low, agriculture's contribution is relatively high (70%)[1], making the management of agriculture emissions relevant in the context of the country's decision to pursue a low carbon development pathway. The major contributors to the greenhouse gas emissions of the agriculture sector in Rwanda are: livestock (43%); rice cultivation (36%); and synthetic fertilizers (20%).[2] It is important to also note that Rwanda remains a net sink in terms of greenhouse gas emissions from land use change, although the magnitude of this reduction to the country's net emissions is estimated to have declined by 87% from 2003 to 2010, as reflected in the table below.

HISTORICAL NET EMISSIONS IN RWANDA: 2000, 2005 AND 2010 (IN KILOTONNES CO_2E [$KTCO_2E$])[3]

SECTOR	2003	2007	2010
Agriculture	3,477	4,179	4,894
Energy demand	969	1,342	1,620
Industrial processes	154	270	275
Energy supply	52	65	69
Transportation	35	44	52
Waste	47	59	59
LULUCF	-14,238	-7,168	-1,866

[1] https://www.iisd.org/sites/default/files/pdf/2013/rep_of_rwanda_greenhouse_gas.pdf
[2] Sources: FAOSTAT and IISD (2013), as cited in draft CSA Profile under development. These figures can be verified once the Rwanda CSA Profile is finalized.
[3] https://www.iisd.org/sites/default/files/pdf/2013/rep_of_rwanda_greenhouse_gas.pdf

Total (without LULUCF)	4,734	5,950	6,969
Total (with LULUCF)	-9,504	-1.218	5,103

> *"The sustainable intensification of agriculture is a key component in building a low carbon and climate resilient agricultural sector. Adaptation, mitigation and development options can be designed and implemented to counter the negative impacts from climate change and reduce the sector's dependency on fossil fuels. Small-scale agriculture can bring wider benefits associated with climate compatible development including food security, improved environmental sanitation, and disaster risk reduction through slope stabilisation and flood mitigation. Terracing and irrigation are already being implemented in Rwanda and will be extended throughout the country."*
> Government of Rwanda National Strategy for Climate Change and Low Carbon Development (2011)

3. Climate Smart Agriculture and USAID Rwanda Feed the Future Strategy and Portfolio

The section below provides a summary of the Feed the Future portfolio in Rwanda with respect to CSA objectives and discusses current perceptions of CSA. Core investment areas in the Rwanda Feed the Future Multi-Year Strategy (2011-2015) included "systems transformation" related to sustainable market linkages, infrastructure, and nutrition, in addition to activities to promote innovation and improved agriculture sector policies. The maize and bean value chains were prioritized as key staple crops, with soy, dairy and coffee also included, based on a range of factors, including Government of Rwanda priorities.

A variety of efforts help agriculture adapt to a changing climate. These are categorized into three general approaches:

Approach 1: Farm technologies & practices. Development, dissemination and management activities that contribute to CSA outcomes, namely adaptation, mitigation and productivity/income generation;

Approach 2: Incentive mechanisms through improved performance of value chains, financial mechanisms, performance compensation, capacity building, data collection and analysis, enhanced governance or other means that promote adoption of climate smart technologies and practices;

Approach 3: Multi-institutional participation and planning that foster integration and coordination of efforts across economic sectors (agriculture, forestry, fisheries, transportation, and finance) at multiple political levels (community-based organizations (CBOs), producer organizations, businesses, agencies - national and international).[4]

[4] Example components of an enabling environment that facilitate CSA outcomes include climate information services, programmatic support for improved risk management, safety nets, or national policy frameworks such as national adaptation plans, NAMAs, etc.

"Integrated soil fertility management: The crop intensification programme in Rwanda currently uses inorganic fertiliser to increase crop yields. These imported fertilisers produce a significant proportion of Rwanda's GHG emissions through soil nitrous oxide (N2O) emissions but also through the fertiliser manufacturing process and transportation. Demand for inorganic fertilisers can be reduced by applying an integrated approach to soil fertility and nutrient management, which employs agroecology, resource recovery and reuse, and fertiliser enriched composts. An integrated approach will significantly increase the effectiveness and efficiency of fertilizer use, helping to lower inorganic fertiliser demand, reduce dependence on oil, reduce GHG emissions and increase farm profitability due to reduced input costs for farmers. This will contribute to reducing vulnerability to external shocks. Such approaches also improve soil structure and the water retention capacity of soils leading to climate resilient agricultural ecosystems and sustainable food security."
Government of Rwanda National Strategy for Climate Change and Low Carbon Development (2011)

A. Farm Technologies and Practices[5]

The table below provides an initial CSA stock-taking of the current Feed the Future Portfolio plus two projects soon to be added to the portfolio. Further suggestions on CSA entry points and opportunities to be explored are highlighted later in this report.

Table1. CSA-relevant technologies and practices in projects and associated benefits

Feed the Future Project	CSA-relevant activities	Sustainable productivity benefits	Adaptation benefits	Mitigation Benefits & Opportunities
Land Husbandry, Water Harvesting and Hillside Irrigation (LWH)	Land Terracing; Other SWC/SALM practices (e.g. fodder crops on terrace risers); Water Harvesting for Irrigation; Marshland drainage and irrigation	Significant yield increases already achieved in priority crops (maize, rice, beans, etc.)	Erosion control; Increased water infiltration/ availability	These practices can produce significant increases in soil and above ground carbon stocks.

[5] This matrix represents only a very partial analysis of the CSA implications of the current Feed the Future portfolio in Rwanda, but is indicative of the sort of more thorough analysis that might be undertaken by USAID as a next step to the initial "deep dive."

Feed the Future Project	CSA-relevant activities	Sustainable productivity benefits	Adaptation benefits	Mitigation Benefits
Rwanda Dairy Competitiveness	Improved forage; Cut and carry; Manure for own use and sale; Expanding access to markets; Preventing post-harvest losses	Milk production per animal can increase significantly	Forage crops can contribute to soil erosion control and fertility (e.g. use of nitrogen-fixing species).	Livestock contributes the largest share of Rwandan agriculture GHG emissions, but emissions per unit production can be reduced through improved practices.
Privatization of Rwanda's Fertilizer Importation & Distribution (PreFER)	Increased availability and use of synthetic fertilizers; Identification of specific soil nutrient deficiencies (boron, sulfur); More efficient nutrient delivery techniques (e.g. urea briquettes)	If properly formulated and applied, fertilizers can significantly increase yields	Manure already being used by farmers. Opportunities exist to expand Integrated Soil Fertility Management (ISFM) practices to improve soil health.	Fertilizer use, although still low, contributes nearly 20% of Rwanda's agriculture GHG emissions. ISFM offers a way to reduce fertilizer needs.
Integrated Improved Livelihoods Program (IILP- EJO HEZA)	Improved Agronomic Practices; Access to Improved Seeds; Access to Fertilizer; Compost Use	Significant yield increases possible in maize and beans.	Use of organic manure/ compost enhances soil health and soil moisture availability.	Improved land management practices have the potential to generate mitigation co-benefits (soil and above ground carbon).
Private Sector-Driven Agriculture Growth (PSDAG)	Promote private sector investment in agriculture; Develop enabling policy environment	Increased investment could contribute to increased production & improved marketing	Project is exploring the development of index-based insurance products with private sector.	Increased investment in post-harvest storage and processing facilities is seen as an opportunity that could reduce post-harvest losses.
Harvest Plus and Orange Flesh Sweet Potato (OFSP)[6]	Plant breeding for climate (e.g. drought and flood tolerance); Crop Insurance; Cropping systems and calendar; Reduced wood use of staking for climbing beans; OFSP more drought tolerant than maize and beans and can provide soil cover	Improved seeds and agronomic practices can increase yields and income, while also enhancing dietary diversity	Increased # of varieties can increase resilience; Increased drought tolerance; Contributions to soil health (increase N fixation, reduced soil erosion)	Improved practices can contribute modestly to reduced deforestation for bean staking and increase biomass production.

[6] These projects were not on-going at the time this assessment was undertaken but were about to get underway. Information gathered from a meeting with CIAT and CIP colleagues is included here to give a sense of the evolution of the Rwanda Feed the Future portfolio.

B. Incentive Mechanisms

Achieving widespread practice of CSA requires adequate incentives to make changes. This sub-section describes how Feed the Future projects provide five types of incentives that foster transformative processes: (i) improved performance of value chains, (ii) financial mechanisms, business skills and governance, (iii) data collection and analysis and policy change.

(i) Value chain performance

In addition to the projects that emphasize input technologies and production practices highlighted above, the projects also contain efforts that improve the performance and farmer participation in post-harvest and marketing links of value chains. The **Private Sector-Driven Agriculture Growth** project specifically aims to create networks that will link producers to buyers and to identify market opportunities for value chain actors. One of its main goals is to upgrade the predominantly informal agricultural value chain made up principally of micro and small businesses, to allow more of these smaller actors to compete on the market. Similarly, the **Dairy Competitiveness** project aims to increase the marketability of milk in Rwanda by increasing access to market information for farmers and stimulating export market facilitation services. The **Integrated Improved Livelihood** project expands access to markets through private-public partnerships. The **Land Husbandry, Water Harvesting and Hillside Irrigation** also focuses on strengthening the agricultural value chain and increase access to markets for small farmers (e.g providing training in market access), leading to up to 74% of beneficiary cooperatives being able to commercialize. Finally, the **Privatization of Rwanda's Fertilizer Import & Distribution System** project also has a key objective of developing a sustainable fertilizer supply chain.

(ii) Financial mechanisms, business skills and governance

Projects within the Feed the Future Rwanda portfolio foster a variety of support mechanisms that facilitate the adoption of CSA practices. The **Dairy Competitiveness** project has provided business development skills training to over 16,000 farmers, cooperatives and farmers groups.[7] The **Integrated Improved Livelihoods Project** has a focus on building the capacity of low income households to access financial services by establishing savings groups for the poor. As 80% of the beneficiaries of this project earn less than $1.25 per day, these groups allow them to access loans, save, plan and invest in school fees, health insurance or further expand their food production. 1,555 savings groups have been established. In addition, this project has helped 1,580 microenterprises access loans from local banks.[8] The **Private Sector-Driven Agriculture Growth** project also aims to improve access to financial services such as credit, saving and insurance along the value chain. This project aims to facilitate $9.4 million in agricultural and rural loans.[9] The **Land Husbandry, Water Harvesting and Hillside Irrigation** project takes a value chain approach to improving productivity and income by ensuring that those who previously lacked access to financial services are connected to local savings and loan organizations. Currently, over 85% of this project's beneficiaries are able to access financial services. Finally, the **Privatization of Rwanda's Fertilizer Import & Distribution System** project promotes increased access to finance through commercial financial services to purchase inputs from private importers.

[7] USAID Dairy Competitiveness Project II Factsheet
[8] USAID Integrated Improved Livelihood Program Factsheet
[9] USAID Private Sector-Driven Agriculture Growth Program Factsheet

(iii) Policy change

The **Private Sector-Driven Growth** project is working with the Ministry of Agriculture and the Rwanda Development Board in order to create an attractive investment setting, improving their ability to attract investment and to plan, implement and measure progress made through the creation of investment promotion and a support system. The **Dairy Competitiveness** project, too, aims to influence policy outcomes with the ultimate goal of having nine policy reforms advocated for or enacted by working with the GoR to strengthen policies relating to animal health, breeding and food safety laws to enable increased competitiveness.[10]

C. Multi-Institutional Participation and Planning

This sub-section describes how the USAID-Rwanda Mission fosters coordinated participation in CSA-related activities. The **Land Husbandry, Water Harvesting and Hillside Irrigation** has helped to form cooperatives, strengthen farmer organizations, promote capacity development and institutional strengthening for production and marketing through workshops and meetings. The project has, to date, grouped 39,000 households into farmer organizations to increase their market access, knowledge sharing and organizational capacity. The **Dairy Competitiveness** project promotes public-private partnerships and policy advocacy in industry through working groups and has reached over 16,000 farmers, including groups and cooperatives for training on best practices, gender and business skills. The **Private Sector-Driven Growth** works to strengthen vertical and horizontal value chain linkages by organizing farmers and cooperatives on a local level through networks to link producers with buyers. This is coupled with training farmers to increase technology transfer and make informed business decisions. Their formal and informal linkages enable collective learning and risk sharing to enable learning.

4. Discussion and future opportunities

This section provides a commentary on current perception on CSA, highlights comments that arose during conversations with implementing partners, and documents future opportunities and challenges for Feed the Future programming in Rwanda.

A. Emerging Messages

Current perceptions of CSA

Based on both a document review and discussion with the implementing partners of USAID Rwanda's current Feed the Future portfolio, a **mixed understanding of the concept of climate-smart agriculture among delivery partners** can be observed and, understandably, there is almost no active management of projects to deliver CSA outcomes. While climate has been one of the three cross-cutting themes in Feed the Future, Climate Smart Agriculture is a new framing for Feed the Future. As such, some Feed the Future projects had difficulty in articulating their work through a CSA lens although the projects had strong CSA components. Nevertheless, a number of aspects of the current and planned programs (production efficiency, sustainability, resilience) align with good CSA practice or offer opportunities for CSA enhancements going forward. One project with very strong CSA components and with a clear awareness of all aspects of the concept is the World Bank-led Land Husbandry, Water Harvesting, and Hillside Agriculture Project, which the GOR sees as one of its flagship agriculture initiatives also supported by

[10] USAID Dairy Competitiveness program description

funds from the Global Agricultural Food Security Program (GAFSP). LWH can reasonably be described as fully addressing all three pillars of CSA, given its emphasis on sustainable agricultural land management and integrated soil fertility and water management practices, which are producing significant increases in agricultural productivity.

B. Future opportunities & challenges

Program prioritization considerations

- Value Chain Selection

For crops already prioritized by Feed the Future in Rwanda (maize and beans), strategies should be pursued to reduce the vulnerability of these crops to future climate change. This may include the selection and promotion of varieties of these crops for desirable, e.g. drought tolerance and disease resistance. Sweet potato, sorghum and other crops already popular with Rwandan farmers and consumers are more drought-tolerant than maize and beans, so their cultivation (especially nutritious varieties like OFSP) should also be encouraged as part of diverse cropping system.

- Soil and Water Management

Build on the experience with terracing and other soil and water conservation practices in the LWH and other GOR initiatives focused on sustainable hillside agriculture. Systematic incorporation of nutritious fodder crops and nitrogen-fixing agro-forestry tree species into such systems will support both reduced soil erosion, enhanced soil fertility, and improved livestock feeding practices as well, including in support of the Mission's dairy target. Given the high cost of imported synthetic fertilizers, the emphasis should be on their judicious use, using soil testing/ mapping to go beyond blanket recommendations to target common deficiencies of Rwandan soils (soil acidity, specific secondary and micro-nutrient deficiencies). The GOR's "One Cow Per Poor Family" and the work of USAID and other donors in the dairy sector also offer scope for increased use of manure and organic compost in farmers' fields[11].

- Dairy Production Practices

The Rwandan Government already promotes the "cut and carry" model of livestock promotion, which is particularly suited to Rwandan conditions (high population density, small landholdings, economic value of manure and potential for 2-3 crops per year. High quality leguminous fodder crops use biological nitrogen fixation to enhance milk productivity, and thus enhance climate smart outcomes. Opportunities to achieve higher production/income and reduced emissions per unit of milk output include upgrading cattle breeds and increased production of nutritious livestock fodder as part of sustainable land management practices.

- Good Production and Post-Harvest Practices

Some current Feed the Future projects already included the promotion of good basic agronomic practices (line sowing, plant spacing, seed selection, crop rotation and season planning/timing of operations), which are known to contribute to sustainable increases in yields. The promotion of such practices should be an element of all Feed the Future agriculture initiatives. The high levels of post-harvest losses associated with agriculture in Rwanda and other African countries is inherently at odds with CSA, working against both

[11] While the Government's program targets poor households and provides a single animal, many smallholders maintain multiple cows and other small livestock and see manure as a valuable by-product. Still demand for manure seems to outstrip supply.

national food security and farmer incomes, while necessitating further expansion of land under cultivation. Significantly reducing post-harvest losses through improved storage, increased post-production processing, and improved farm-to market transport is particularly climate-smart in the resource-constrained Rwandan context. By its own admission, the PSDAG (Private Sector-Driven Agriculture Growth) Project does not integrate climate analysis in its design and management, but the project still has potential to realize CSA outcomes, for example by promoting initiatives that significantly reduce post-harvest losses from farm to market, which remain high in the Rwandan context. Opportunities for PSDAG to enhance the resilience and adaptation of maize and other crops, e.g. drought tolerance, low-soil N tolerance, also offer climate-smart impacts. Additionally, there will be opportunities for PSDAG to enhance CSA outcomes working with private sector and supporting policy options that increase yields/incomes, adaptation and mitigation of climate change in pre-farm and post-farm food system.

- Crop Insurance

The PSDAG (Private Sector-Driven Agriculture Growth) Project is exploring opportunities with insurance companies to develop index-based insurance products as part of a broader effort to enhance the provision of financial services to the agriculture sector. The development of such risk transfer products could encourage banks to allocate additional capital to agriculture vis-à-vis other sectors currently seen as less risky (e.g. urban housing).

- Climate Information Services[12]

The Climate Services for Agriculture program, which is in the pipeline for imminent implementation, represents an opportunity for Feed the Future projects to benefit from better climate information to incorporate the climate variable into the operations and strategies of all Feed the Future projects. This new project, which is funded by the Africa Bureau, has been designed to build the capacity of Rwandan Government agencies to deliver climate services to the benefit of agriculture, but the USAID mission has a clear opportunity to align some of the beneficiaries of this project to coincide with Feed the Future target beneficiaries, and hence strengthen CSA-related outcomes. (See Text box below for additional details.)

- Renewable Energy

Increased availability of affordable energy in rural Rwanda will contribute to Rwanda's Green Growth strategy in a variety of ways, enabling increased use of irrigation and post-harvest storage and processing. Reduced dependence on expensive fossils fuels will simultaneously enhance Rwanda's national economic security and lower future emissions. Renewable energy options should, therefore, be taken advantage of in agricultural mechanization, such as solar-powered irrigation pumps.

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[12] Definition of a climate service from the Taskforce report (May 2011 to WMO congress):
Climate information prepared and delivered to meet a user's needs. Providing climate information in a way that assists decision making by individuals and organizations. A service requires appropriate engagement along with an effective access mechanism and must respond to user needs. Users include farmers, government policy makers, private sector, and civil society actors. Seasonal forecasts are an example of one climate information service product. For more details, see:
http://www.climrun.eu/elfinder_vfs/208/trieste-goodess.ppt.pdf

5. Conclusions and key recommendations

The CCAFS CSA deep dive assessment in Rwanda resulted in a number of conclusions relevant to USAID's strategy and program portfolio under Feed the Future, including:

- Climate risk is relatively small but vulnerability is increasing with significant implications for food security and the national economy if not aggressively addressed;
- Government of Rwanda's awareness of climate risks and efforts to address these risks in national programs are growing. Strong government priorities, policy framework and strategies, with CSA squarely articulated within them provides an attractive entry point;
- There are CSA successes, and USAID's Feed the Future portfolio in Rwanda has significant potential to move forward as evidenced by current "climate-smart" elements in some projects (particularly the LWH project, which describes itself as "more than climate smart"), and there are many avenues for building on these elements and adding others as part of a more comprehensive approach. Efficient use of resources is the entry point as well as post-harvest loss, food-water-energy nexus, and renewable;
- CSA benefits are largely anecdotal; very little hard evidence available or being collected to robustly articulate the CSA angle of ongoing and new projects. However, CSA outcomes are congruent with the Feed the Future pipeline and significant opportunities exist.

The current Feed the Future strategy and portfolio in Rwanda already provides a solid platform for CSA, but several possible pathways for building on that success can be pursued. The following are some key recommendations:

- ✓ Explore opportunities to more systematically apply a CSA lens to new Feed the Future initiatives in Rwanda. The next generation of Feed the Future projects in Rwanda includes several with strong CSA components. This includes several partnerships with the CGIAR system, including: Climate Information Services (CCAFS; see text box below); Harvest Plus Iron-Rich Beans (CIAT); and Orange Flesh Sweet Potato (CIP). Given the Mission's maize target, it should also consider the opportunity to leverage CGIAR work on climate-resilient maize, which would have a dual benefit of increasing productivity through better genetics (drought-tolerance, disease-tolerance, low-Nitrogen adapted), while also strengthening public and private seed systems. The addition of a climate information services component to the portfolio has obvious potential to support the GOR's ability to provide climate-smart agricultural advisory services to Rwandan farmers. Iron-rich beans and OFSP not only directly contribute to CSA outcomes (e.g. beans fix nitrogen) but also have high potential to reduce the high levels of chronic malnutrition still prevalent in Rwanda;
- ✓ In addition to the CSA practices highlighted in this report, such as soil and water conservation practices (e.g. terraces); integrated soil fertility management and 4R nutrient stewardship; and efficient irrigation systems, there are other CSA opportunities that are particularly relevant in the Rwanda context, including non-land based adaptation and mitigation opportunities in the food system such as initiatives focused on renewable energy and post-harvest loss reduction.
- ✓ Use the CSA lens in designing the new "integrated agriculture and nutrition" project included in USAID Rwanda's next generation Feed the Future portfolio. It is important to note here that applying a CSA lens can and should be done in a way that is consistent with other important Feed the Future outcomes and cross-cutting themes related to women's empowerment, improved nutritional outcomes, and the profitability of smallholder agriculture, all with the goal of contributing to the GOR's national food security objectives. This CSA lens includes, e.g., resource-use efficiency, heat, drought, disease tolerance, ISFM, integration of legumes and increased biomass production,

efficiencies in input and output markets, reduced post-harvest losses, improved storage and better market and weather information.;

- ✓ Wherever possible, build CSA-related outcomes into the M&E frameworks of current and future Feed the Future projects in Rwanda. CSA outcomes are often being experienced as byproducts of other activities but are rarely tracked. Extensive work is currently being undertaken in the CGIAR system and elsewhere to identify appropriate and context-specific CSA indicators;
- ✓ Deepen policy and private sector support towards climate resilience along value chains and the food system (pre-farm, on-farm and post-farm. Incorporate broader thinking on the food-water-energy nexus in the context of the next phase of Feed the Future strategy in Rwanda. Explore opportunities in the renewable rural energy sector, as well as improved post-harvest handling and marketing to reduce losses in the Rwandan food system. Given Feed the Future's focus on poverty reduction and nutrition outcomes, USAID might consider funding such complementary initiatives from other agency initiatives, e.g. those dealing with climate change and energy.

Toward a "Climate-Informed Rwandan Society: Climate Services for Agriculture to Empower Farmers to Manage Risk and Adapt to a Changing Climate"[13]

The primary purpose of the "Climate Service for Agriculture" project is to **increase the resilience of farmers to the changing climate in Rwanda and improve climate risk management skills and hence agricultural productivity for Rwandan farmers**. The activity's overall aim is to develop a fully functional climate service, providing a range of services and information, that will inform and support the various technical offices, policy and decision-makers within the Government of Rwanda (GOR), farmers and others working in the agricultural sector in Rwanda to make informed decisions in the face of a changing climate and improve climate risk management.

Specific objectives are as follows:

1. Strengthen the capacity of Meteo-Rwanda to deliver needed operational climate information services for agriculture and food security;
2. Enhance an approach to integrated climate services in Rwanda with food security planning and contingency agencies to strengthen responses to climate risks;
3. Develop a sustainable governance framework for climate services and a formalized institutional interface between Meteo-Rwanda, the Ministry of Agriculture (decision-makers) and the Rwanda Agriculture Board (research and extension service), in order to strengthen their capacity to work together as full partners in the co-development of tailored climate services for farmers;
4. Strengthen the capacity of agricultural extension staff, as well as communicators and other stakeholders (e.g. NGOs, farmer cooperatives, rural radio networks, ICT providers, etc), to communicate climate services at large scale for farmers across Rwanda.

Given the specifics of the Rwandan context and current and future climate-related vulnerabilities, USAID Rwanda should see CSA as a good fit for its food security programs. Importantly, the CSA lens is already being applied by the Rwandan Government and embedded in a number of the country's flagship agriculture initiatives,[14] driven by the central imperative of embedding the efficient use of available

[13] The content of this text box is drawn from the Program Description for this new USAID Rwanda initiative.
[14] These were described by the Director General of the Rwanda Agriculture Board as: land husbandry; irrigation; livestock (One Cow per Poor Family); and Agro-Forestry.

natural resources in all agriculture-sector initiatives. Some current Feed the Future projects in Rwanda acknowledge that climate change has not been explicitly considered in their design, and this is partially attributable to the fact that near-term weather stresses are lower than in many other countries. Even so, these projects have the potential to contribute to the increased productivity and climate resilience of Rwandan agriculture by applying approaches that promote efficiency in input use and reduction of post-harvest losses resulting in reduced emissions intensity as a co-benefit.

Annex

Reported results from electro-survey

CSA tech & practice	Score	Comments
Other conservation ag	4	Practices from *soil & fertilizer management* (brown cells), *water management* (blue cells) and *livestock management* (pale pink cells) were reported as being adopted by >66% of FTF farmers. Practices from *post-harvest, crop management* (pale green cells) and *water management* reported adoption by 33-66% of farmers. Two practices from *soil & fertilizer management* were reported as being common but not FTF activities. The remaining activities were, perhaps mistakenly, reported as having no adoption. *Legend* 4 = > 66% 3 = 33-66% 2 = <33% 1 = pilot 0 = none U = unknown *N* = not applicable A = already common *With respect to participating FtF farmers*
Fertilizer & residue inputs	3	
Nitrogen fertilizer efficiency	3	
Ruminant management	3	
Reduce post-harvest loss	1	
Diversification w/ trees	1	
Irrigation efficiency	1	
Farmplot crop diversification	1	
New irrigation mechanics	1	
Organic matter management	0	
Other CSA activities	0	
Avoided conversion	0	
New/different crops	0	
Wood lot establishment	0	
Weather/climate information	0	
Other bioenergy	0	
Reduced energy use	0	
Crop harvest risk insurance	0	
Water saving in rice	0	
Biogas from manure	0	
Stress-tolerant varieties	0	
Grassland management	0	
Reduced tillage	A	
Reduced biomass burning	A	