

# Climate-Smart Agriculture in the Gambia

## Climate-smart agriculture (CSA) considerations

**P** The Gambia's economy thrives on agriculture which has key implications for poverty reduction and food security. There is a rising need to intensify production to meet the food demands of the growing population. However, this growth in food production and productivity needs to be undertaken within the framework of the need to also reduce greenhouse gas (GHG) emissions from the agriculture sector.

**M** Livestock represents a major source of GHG emissions (57.6% of agriculture emissions), however, there are opportunities for improving pasture management, modifying fodder sources and integrating vegetation to reduce livestock related emissions and improve land management practices.

**A** CSA activities in the Gambia are presently largely conducted individually by various organisations who are conducting various CSA related work such as conservation agriculture, integrated pest and disease management, farmer managed natural regeneration, system of rice intensification, composting and irrigation among others.

**I** There are so far no funding organizations at the bilateral and multi-lateral levels directly supporting CSA in the Gambia. There are, however, donor-supported climate change projects such as the Global Climate Change Alliance (GCCA) and the Global Environment Facility (GEF) that have supported CSA-related initiatives implemented by Government and Civil Society Organizations (CSOs).

**I** Capacity building of local institutions on climate-smart agriculture (CSA) as well as public awareness raising on CSA will be crucial for supporting the scaling out of CSA in the country. At the same time, the large scale promotion of CSA adoption will also rely on encouraging collaborative research and development of locally appropriate CSA practices and technologies.

**\$** The Gambia's INDC indicates the need for establishment of the Gambia Climate Change Fund (GCCF) as a priority for the country. All efforts need to be made to ensure that the Fund has a mechanism for directing finance towards agricultural adaptation and mitigation related projects, as well as supporting the country to monitor and track where climate change funds are going and their impact.

**I** The mainstreaming of climate change adaptation and mitigation and particularly CSA, into agriculture and economic development policies will play a key role in supporting the financing and adoption of CSA practices on a large scale.

**A** Private sector investment has been noted as being key to improving agricultural value chain development in the Gambia as well as contributing to farmer livelihoods through the opening of new income streams and agribusiness opportunities. Efforts should be made to ensure that these investments are directed to climate-smart practices that also contribute to resilience and GHG emissions reductions where possible.

**A** Adaptation    **M** Mitigation    **P** Productivity    **I** Institutions    **\$** Finance

The climate-smart agriculture (CSA) concept reflects an ambition to improve the integration of agriculture development and climate responsiveness. It aims to achieve food security and broader development goals under a changing climate and increasing food demand. CSA initiatives sustainably increase productivity, enhance resilience, and reduce/remove greenhouse gases (GHGs), and require planning to address trade-offs and synergies between these three pillars: productivity, adaptation, and mitigation [1].

The priorities of different countries and stakeholders are

reflected to achieve more efficient, effective, and equitable food systems that address challenges in environmental, social, and economic dimensions across productive landscapes. While the concept is new, and still evolving, many of the practices that make up CSA already exist worldwide and are used by farmers to cope with various production risks [2]. Mainstreaming CSA requires critical stocktaking of ongoing and promising practices for the future, and of institutional and financial enablers for CSA adoption. This country profile provides a snapshot of a developing baseline created to initiate discussion, both within countries and globally, about entry points for investing in CSA at scale.

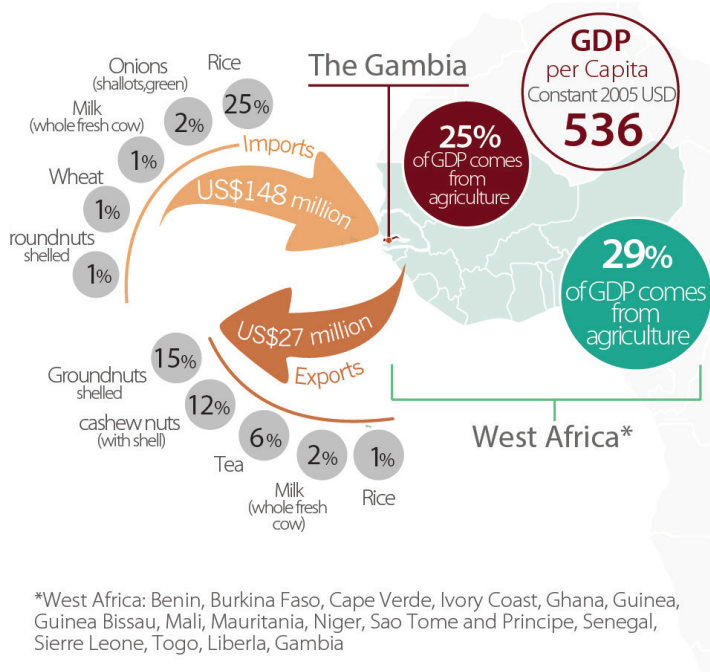


# National context

## Economic relevance of agriculture

Agriculture is a major economic activity in the Gambia contributing 25% of the gross domestic product (GDP) and employing about 70% of the labour force [3] with 32% into active primary agricultural production. Agriculture is the main source of income for about 72% of the extremely poor rural households [3]. The sector is characterized by small-scale, subsistence rain-fed crop production (mainly groundnuts, coarse grains, rice, and cassava), traditional livestock rearing, semi-commercial groundnut and horticultural production, small-scale cotton farming and a large artisanal fisheries sub-sector [3]. Agriculture in the Gambia is challenged by poor infrastructure, soil fertility depletion, declining agriculture commodity prices, soaring prices of production inputs and low private investment. The country continues to depend on imports of many agriculture products especially refined sugar and linseed oil both of which constitute 26% of the total import value of agriculture products.

### Economic relevance of agriculture in the Gambia



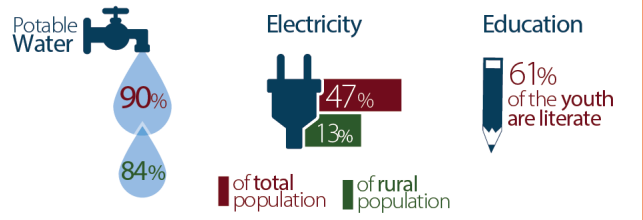
Source: [4,5]

## People, agriculture and livelihoods in the Gambia

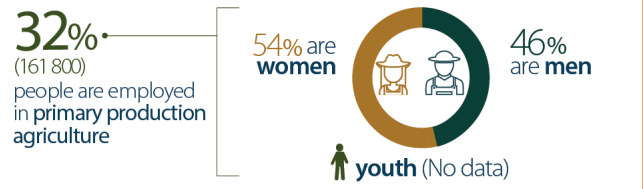
### Demographics



### Access to basic needs



### Jobs in agriculture



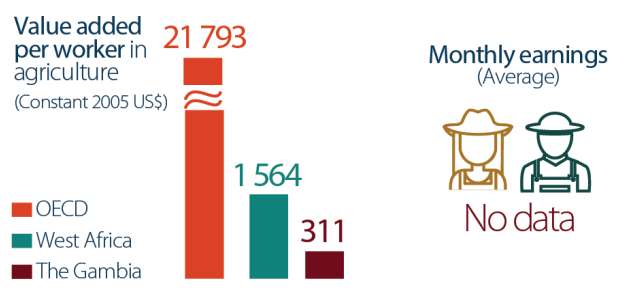
### People living below



### Gender inequality (Index)



### Agriculture productivity and incomes



Source: [4, 5, 6]

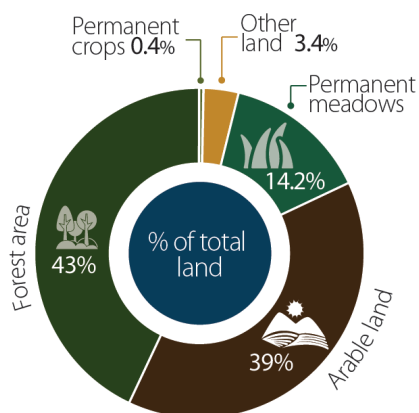
## Land use

Agricultural land in the Gambia constitutes approximately 54% of the country's total land area [4]. During the last two decades, the area of land under agriculture has increased from 557 000 hectares to 605 000 hectares. At this same period, the total arable land area increased by 173% (about 8.7% per annum). Despite significant increases in population, the country's forest cover increased by 8.2% between 1994 and 2014 as a result of its participatory forest management policy which aims at transferring State forests to local communities for livelihood improvement and environmental protection [4].

### Land use in the Gambia

Agricultural area

605 000 ha  
= 54% of total land area



Source: [4, 6]

## Agricultural production systems

The Gambia has three main agroecological zones (AEZs) based on biophysical characteristics (Annex 1). The Sahelian Zone records less than 600 mm total annual rainfall with up to about 70 days of active crop production during the raining season. Characterized by soils of low water holding capacity, the Sahelian zone is noted for early maturing, short-duration and drought tolerant crops [3]. Cassava, cowpea and sesame are the main crops with millet grown only intermittently because of the risk of bird damage. The Sudan-Sahelian Zone known for its longer growing season (79 - 119 days) and within a 600 to 900 mm rainfall isohyets are well suited for groundnut, sorghum and cotton in the upland areas. However, the flood plains along the Gambia River and associated lowland valley systems are an excellent rice growing catchment under tidal swamp irrigation. The Sudanian-Guinean Zone lies within the 900 to 1 200 mm rainfall isohyets. The growing season is 120-150 days and in normal seasons full crop water requirements are met throughout the growing season. The principal crops cultivated in this agroecology are early millet, groundnut, rice (rain-fed upland and lowland, irrigated lowland, mangrove and mangrove salt-tolerant), maize, vegetable, cowpea and sesame [3].

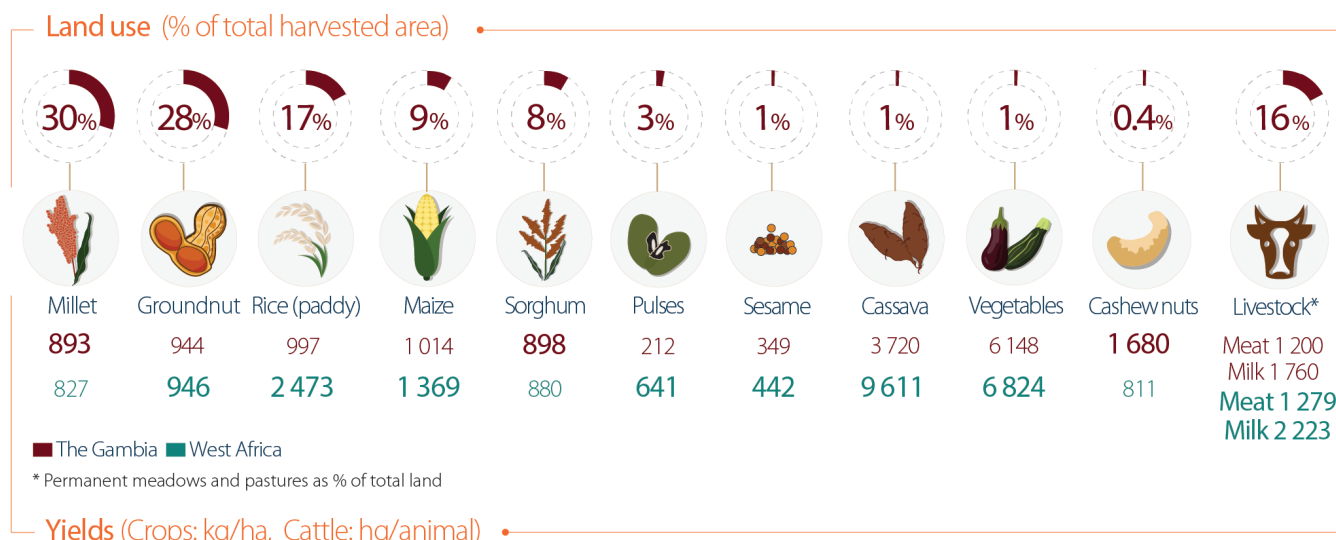
Agriculture in the Gambia is largely dependent on rainfall with only 5% of land under cultivation equipped with irrigation. Production systems generally have low input of fertilizers and pesticides. Fertilizer consumption per unit of arable land is about 5.95 kg per hectare which is about two times lower than the West Africa regional average [5]. Farmlands are generally small scale with dominant production of millet, groundnut, rice, maize and sorghum which covers approximately 24%, 23%, 15%, 8% and 7% respectively of the total land under cultivation in the Gambia. Pulses and vegetables occupy less than one percent of the total agriculture area. Meanwhile, groundnut remains a major cash crop for the Gambia with about 5% contribution to the national GDP. Rice, sorghum, millet and maize are generally produced for subsistent purposes [3]. With the exception of millet, yields of the major food crops are generally lower than the West Africa regional average. Compared with the regional average, current estimates show yield gap of 88 kg/ha, 982 kg/ha, 817 kg/ha and 8 kg/ha for groundnut, rice, maize and sorghum respectively. However, there is opportunity for closing the gaps through investments in irrigation and promotion of best soil fertility management approaches the lack of which reportedly impedes crop production in the Gambia [3].

The livestock sub-sector continues to contribute to the livelihood of the rural population, enhancing food security and income, and fulfilling socio-cultural obligations from acquisition, possession and sale of cattle and small ruminants. Cattle totaling on average (from 2010 – 2014) 422,302 heads are the most valuable asset in the sub-sector, closely followed by small ruminants comprising sheep (359 799) and goats (319 056) [3].

The Fisheries sector contributes on average 12% of GDP. An estimated 30 000 people are employed in the artisanal fishery sub-sector serving as a source of livelihoods system for about 200 000 people. The artisanal fishing sector is the dominant fishery in the Gambia providing direct employment to 1 410 head fishermen and 4 694 assistant fishermen [3, 4]. Total fish caught from both the artisanal and industrial sub-sectors was estimated at nearly 40 000 tons in 2006 [3, 4]. Out of this, the artisanal fishery contributed approximately 37 000 tons (93 percent) with the remaining 3 000 tons (7 percent) being landed by the industrial and sole fishery. It is noteworthy that these catches represent only one-third of the estimated Maximum Sustainable Yield (MSY) of the Gambian waters [3, 4].

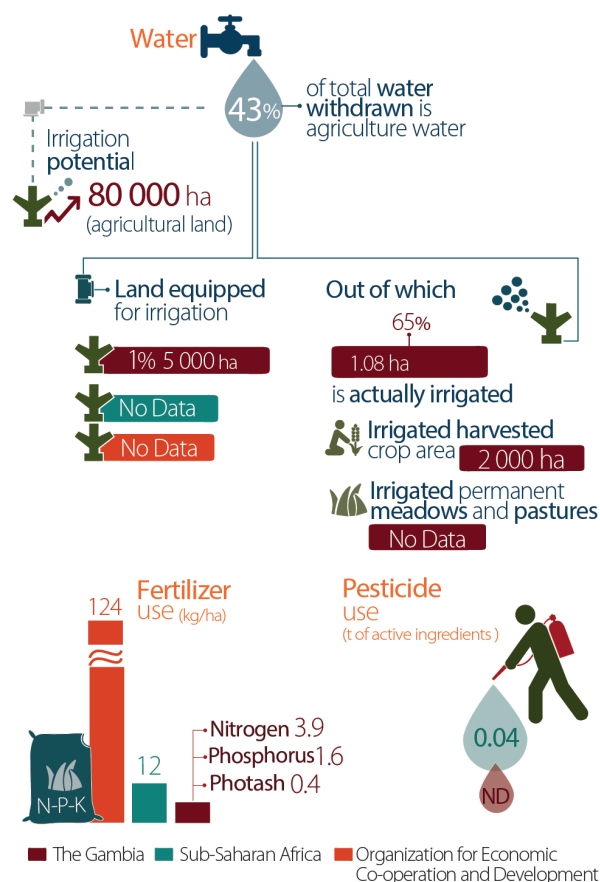
The following infographic shows a selection of agricultural production systems considered key for food security in the Gambia. The selection is based on the production system's contribution to economic, productivity and nutrition quality indicators. For more information on the methodology for the production system selection, consult Annex 2.

## Production systems key for food security in the Gambia



Source: [4]

## Agriculture input use in the Gambia



Source: [4]

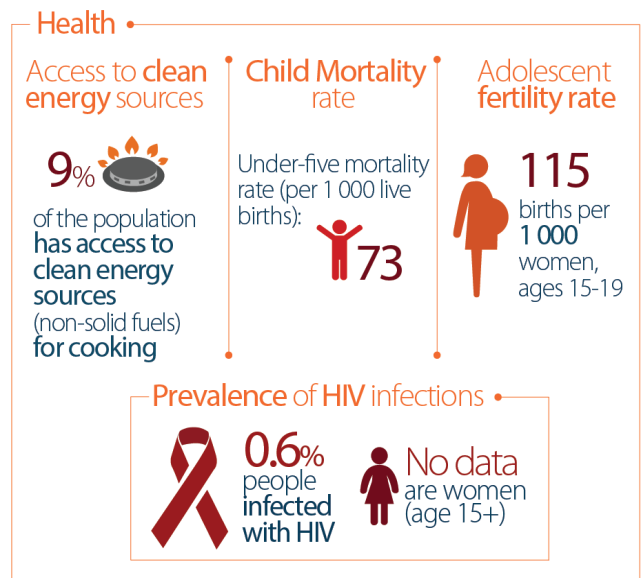
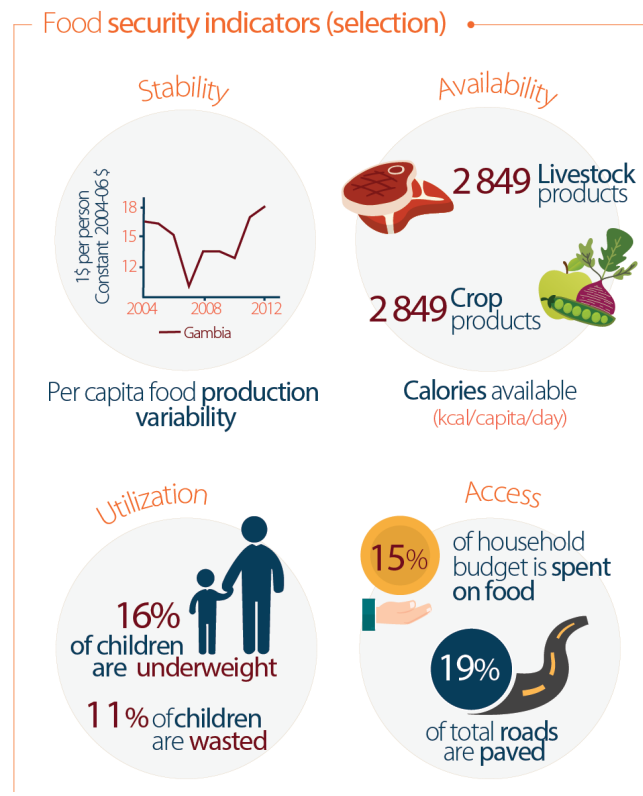
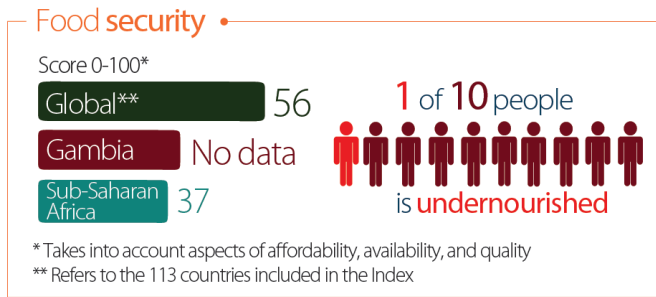
## Food security and nutrition

With a Human Development Index ranking of 168 out of 182 nations in 2008 [7], the Gambia is classified as a 'low income' and 'food deficit' country with about 48% of the population living under the poverty line [4]. One in ten members of the population is food insecure whilst one in three Gambians is vulnerable to food insecurity [8]. The Comprehensive Food Security and Vulnerability Analysis (CFSVA) report of 2016 did reveal that 148,458 persons (8%) of the population in 4 regions of the country (Basse, Janjangbure, Kuntaur and Mansa Konko) are food insecure and or highly vulnerable to food insecurity. This marks an increase in the proportion of the food insecure and malnourished population by 6% between 2010 and 2015. The report further reveals that the majority of the Gambian households don't earn more than about USD 438 on annual basis [8]. This clearly manifests a huge gap of income for food provision. In these 4 regions of survey, food insecurity has surged between 12% and 18% in five years (2011-2016). Chronic food insecurity has resulted to high malnutrition rates as evidenced by an increase of 10.3% in 2015 of the prevalence rate of the Global Acute Malnutrition (GAM). This marks an increase of 0.4% since 2012 [8]. The same source indicates that the national stunting rates were recorded at a critical high of 24.9% in the four regions of the assessment in 2016 [8]. It is worthy of mention that locally produced food in these areas of study and other regions of the Gambia doesn't last more than 6 months and that the producers depend on food imports like their peers in the urban areas in the remaining period of the year. Ameliorating food insecurity and nutrition gaps will require increased and improved production of nutritive food crops through appropriate food chain mechanisms. Interventions must also focus on relevant value addition systems with special emphasis on nutrition-based processing. Also important is to ensure increased access



and ownership of productive land for women and other vulnerable groups with a view to enhancing their livelihoods systems. This will enhance effective and participatory land use planning as well as ensure diversification on farming systems and crop production. Meanwhile, the Gambia has one of the lowest prevalence of HIV/AIDS in Africa, currently about 2% as at 2015 for populations between 15 to 49 years old [4].

### Food security nutrition and health in the Gambia



Source: [4, 5, 19, 20, 21]

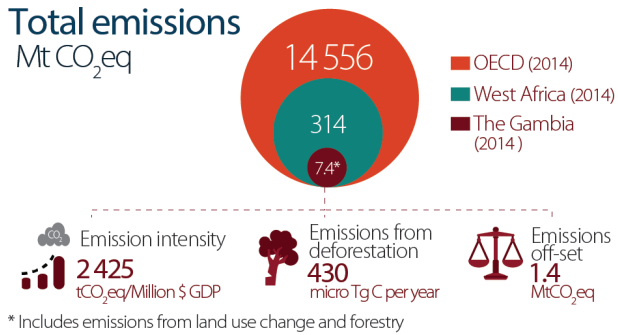
### Agricultural greenhouse gas emissions

Although the Gambia is one of the countries least responsible for climate change, it has ratified the United Nations Framework Convention on Climate Change (UNFCCC) and has committed to engage in the development and implementation of many of the actions of the framework. The Gambia's current total GHG emissions stand at  $7.2 \times 10^{-7}$  Mt  $\text{CO}_2\text{eq}$  as at 2013. Sectorally, the highest emissions (79%) came from agriculture while the energy sector contributed about 10%. Minimal emissions from waste management (0.5%) and other sources are also reported [4]. With respect to the agriculture sector, about 65% came from the livestock sub-sector where enteric fermentation contributed to about 36% of methane emissions while manure left on pastures constituted about 26% of emissions from methane and nitrous oxide [4].

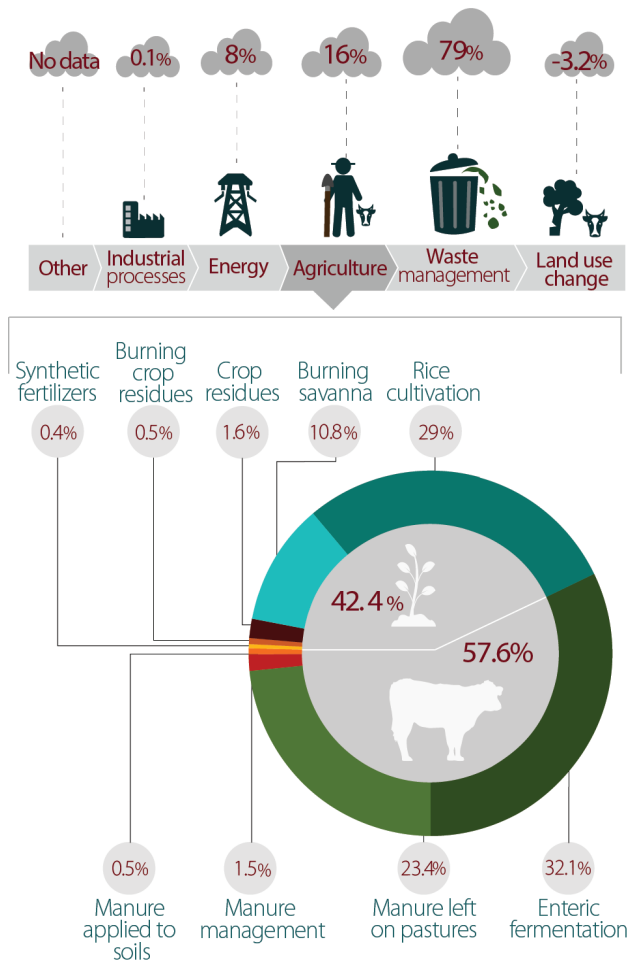
The initial action in curtailing emissions entailed the development of the Nationally Appropriate Mitigation Actions (NAMA) which seeks to reduce greenhouse gas emission (GHG) by about 44.4% in 2025 and 45.4% in 2030 [9]. The Gambia plans to approach the reduction of GHG emission through the unconditional mitigation of the agricultural and energy sectoral actions. Unconditional mitigation actions include the use of renewable energy sources in lighting, communication and health facilities, lifting of water from wells and boreholes and afforestation activities such as tree planting. The use of renewable energy is expected to contribute to GHG emission reductions of 45.6 Gg $\text{CO}_2\text{e}$  in 2020, 78.5 Gg $\text{CO}_2\text{e}$  in 2025 and 104 Gg $\text{CO}_2\text{e}$  in 2030 whilst afforestation will contribute reductions of 220.3 Gg $\text{CO}_2\text{e}$  in 2020, 275.4 Gg $\text{CO}_2\text{e}$  in 2025 and 330.5 Gg $\text{CO}_2\text{e}$  in 2030 [10]. Mitigation options under the agriculture sector will be marked by the production of NERICA rice and the promotion of "Rice efficiency" production. NERICA rice production will result to estimated emission reductions of 124.1 Gg $\text{CO}_2\text{e}$  in 2020, 397.7 Gg $\text{CO}_2\text{e}$  in 2025 and 2030 whilst the option

of 'rice efficiency' production will give estimated emission reductions of 437.8 GgCO<sub>2</sub>e in 2020, 707.0 GgCO<sub>2</sub>e in 2025 and 2030. The conditional mitigation option in the energy sector consists of traditional biomass and petroleum products. Five options (reduced transmission losses, efficient lightning, solar water heating, renewable energy and energy efficiency and efficient cooking stoves) have been analyzed for emission reductions in the 3 target years (2020, 2025 and 2030). A combined emissions reductions of 425.7 GgCO<sub>2</sub>e in 2020, 541.1 GgCO<sub>2</sub>e in 2025 and 629.6 GgCO<sub>2</sub>e in 2030 is expected from this analysis [9, 10].

## Greenhouse gas emissions in the Gambia



## Sectoral emissions (2014)



Source: [4, 11]

## Challenges for the agricultural sector

Agriculture in the Gambia is faced with many challenges despite government efforts to boost the sector through the launch of the Gambia national agriculture investment plan (2011 – 2015). The following are contributory factors to the current poor performance of the sector:

- The Gambia's low-lying topography, combined with her high dependence on subsistence rain-fed agriculture, and inadequate drainage and storm water management system in a context of rapidly expanding unregulated urban expansion has placed her among those countries most vulnerable to climate change [12]. Despite the use of technology and greater expansion of land under cultivation, the trend in agricultural production and productivity in the Gambia is generally seen to spiral down over recent years. There is evidence of climate induced hazards and disasters such as low and erratic rainfall, increased temperatures and sea-level rise which all translate into droughts, floods, windstorm and salinity among others.
- Irrigation covers a small area of production that is largely concentrated on rice cultivation. Water control measures and irrigation structures are inadequate, and available resources are not easily accessible to the large majority of producers [13]. Apparently, there is gradual shift from pump to tidal irrigation which requires no use of fossil fuel dependent machinery. The use of boreholes with solar powered mechanisms is also coming up but largely limited to horticulture (vegetable gardens and fruit tree production).
- Soil fertility in the Gambia has eroded exponentially owing to excessive cultivation and the use of inappropriate farming systems. Soils in the Gambia are generally poor in organic matter and chemical fertility, requiring high input of manure and fertilizer to increase yield and quality [13]. Land degradation and soil nutrient runoff are common through water and wind erosion as well as poor agricultural mechanization.
- Higher temperatures and humidity have measurable adverse impacts on small ruminants, which make important contributions to household economies. The result of intense climatic stress on free grazing small ruminants include: significant reduction in milk yields; slow growth rates; decreased reproductive rates and increased mortality rates. Continued global warming and increasing humidity are also expected to have a negative effect on food intake of birds, thus reducing the productivity of poultry [13].
- Pests and disease incidences have continued to impair progress in both crop and livestock production in the Gambia. These incidences significantly undermine

the production and quality of crop and horticultural produce.

- Forest resources are subject to high levels of vulnerability to natural and human induced climate vagaries. With a significant number of the Gambian population directly or indirectly depending on forest resources for their livelihoods systems, there are possibilities of over-exploitation in the form of rampant tree felling, logging and bush fire occurrences all of which can suppress growth (afforestation) and disrupt the ecosystem through loss of biodiversity among other things.
- Marketing of agricultural commodities has long been a challenge in the Gambia. The sector was until recently subsistence-based with a larger majority of smallholder farmers lacking knowledge and skills on aligning agricultural value chains to marketing and commercialisation. Thinking of a value chain as a business and understanding how to minimize costs, improve efficiencies, differentiate products, and overcome challenges to achieve profitability is critical to achieving sustainable livelihoods.

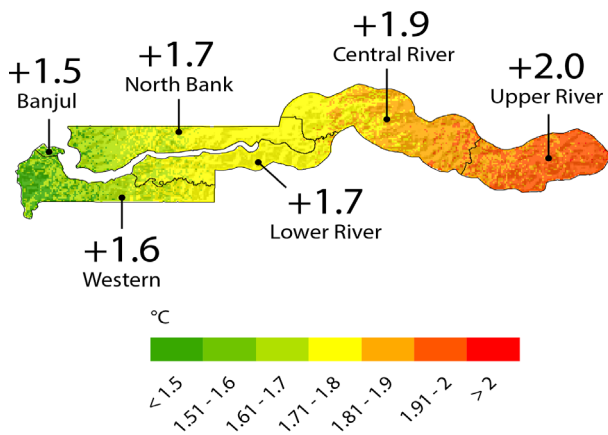
## Agriculture and climate change

Agricultural production in the Gambia is largely dependent on rain-fed subsistence farming which is inhibited by numerous climate factors including rainfall variability, increased temperatures and sea level rise [3].

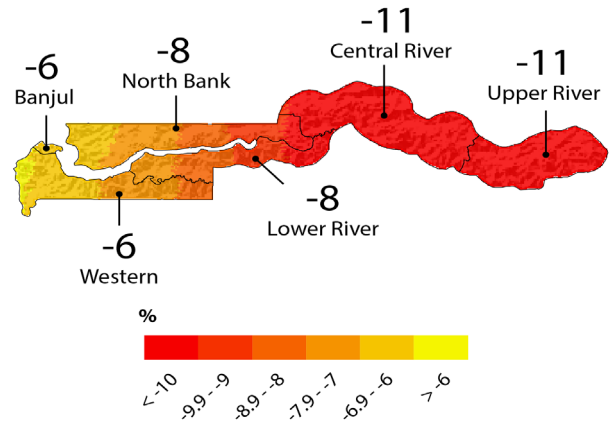
For instance in 2011, decline in yield owing to unpredictable rainfall patterns was high at 79% for upland rice, 54% for millet and 67% for groundnuts compared to 2010 records on the same crops [13]. Since 1960, the Gambia has experienced increasingly erratic rainfall patterns, higher intensity storms, intra-seasonal drought and increasing average air temperatures, accompanied by periodic cold spells and heat waves [14]. Available literature points to an increased average temperature between 3 and 4.5°C, bringing with it an increase in potential evapotranspiration by 2075 [15]. With respect to projected rainfall, GCM model outcomes vary widely between -59% and +29% of the 1951-1990 average of 850 mm per annum [15]. It is also reported that the low-lying topography of the country coupled with a 1 m rise in sea level could potentially inundate over 8% of the country's land area. This includes over 61% of current mangroves, 33% of swamps, and over 20% of current lowland rice growing areas [15].

### Projected changes in temperature and precipitation in the Gambia by 2050

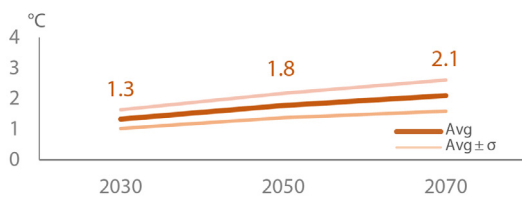
Changes in annual mean temperature (°C)



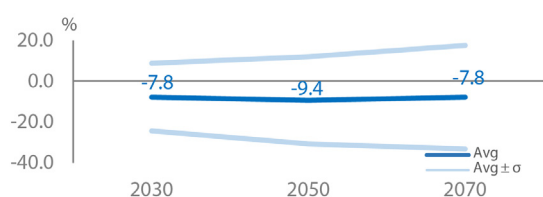
Changes in total precipitation (%)



Average temperature (°C)



Average precipitation (%)



Source: [6, 17, 18]

## CSA technologies and practices

CSA technologies and practices present opportunities for addressing climate change challenges, as well as for economic growth and development of the agriculture sector. For this profile, practices are considered CSA if they enhance food security as well as at least one of the other objectives of CSA (adaptation and/or mitigation). Hundreds of technologies and approaches around the world fall under the heading of CSA.

In the Gambia, there are already farming systems practices being undertaken by smallholder farmers that conform to the principles and strategies of sustainable agriculture including CSA. The practices can generally be categorized as follows:

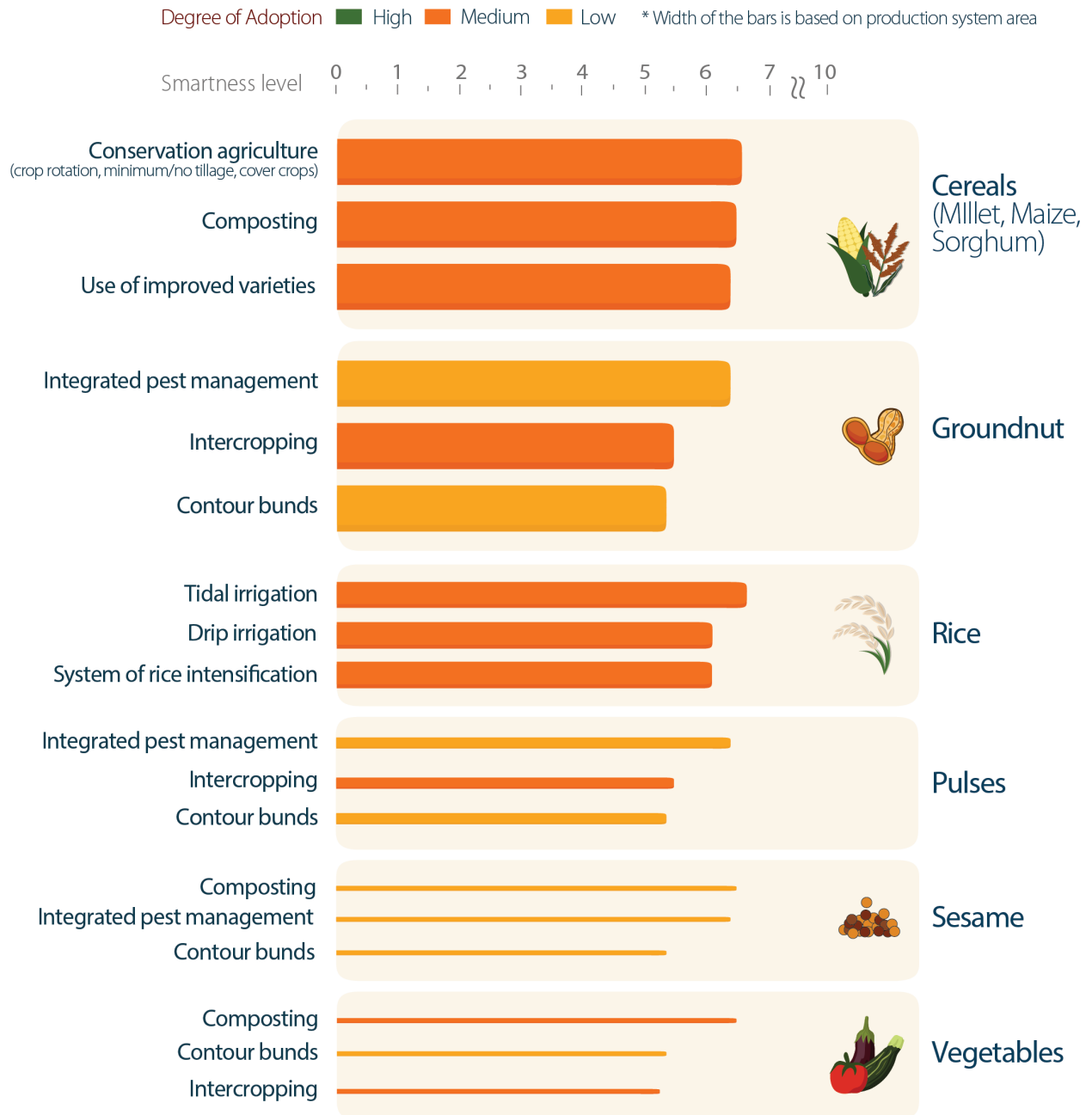
- **Soil and nutrient management** – where farmers use compost from manure and crop residues, legumes for natural nitrogen fixation or as green manures planted in intercropping systems as part of a scheme of crop rotation or in agro-forestry systems. Using these methods and practices markedly reduce the need of synthetic fertilizers which, apart from their high costs contribute to GHG emissions [19].
- **Water harvesting and use:** Improved water harvesting and retention (such as pools, dams, pits, retaining ridges, etc.) and irrigation systems are fundamental for increasing production and addressing the increasing irregularity of rainfall patterns. Common irrigation facilities in the Gambia are pump and tidal systems and boreholes with different distribution facilities such as reservoir tanks and overhead drip systems. Water catchment tanks are also used in some schools to harvest rain water that is used for irrigation in vegetable gardens and orchards. There are also soil and water conservation structures in the form of dikes, bunds and spillways that facilitate water retention and combat salinity.
- **Pest and disease control:** There is evidence that climate change is altering the distribution, incidence and intensity of animal and plant pests and diseases as well as invasive and alien species. Control measures from the CSA perspective and which are common in the Gambia include traditional and physical approaches. The integrated pest management approach is also widespread following its introduction by the Pest Management Unit of the Ministry of Agriculture.
- **Resilient ecosystems:** Improving ecosystem management and biodiversity can provide a number of ecosystem services, which can lead to more resilient, productive and sustainable systems that may also contribute to reducing or removing greenhouse gases. In the Gambia agroforestry systems such as alley farming, farm border planting as well as the use of energy-efficient equipment such as improved cooking stoves are carried-out in many communities.

- The National Agricultural Research Institute as well as NGOs such as Njawara Agricultural Training Centre (NATC), ActionAid the Gambia and Concern Universal support the promotion and up scaling of techniques such as establishment of woodlots and community forests which contribute to household fuel needs and contribute to climate change mitigation and sustainable land management.
- **Genetic resources:** The National Agricultural Research Institute (NARI) of the Gambia continues to release new crop and animal breeds suitable for climate change adaptation. These include early maturing, high yielding and drought resistant crop varieties suitable for the changing climate. Similarly, there are diversified and sustainable livestock husbandry systems that have marked improvements on food security and nutrition for farmers.

The following graphics present a selection of CSA practices with high climate-smartness scores according to expert evaluations. The average climate smartness score is calculated based on the practice's individual scores on eight climate smartness dimensions that relate to the CSA pillars: yield (productivity); income, water, soil, risks (adaptation); energy, carbon and nitrogen (mitigation). A practice can have a negative, positive or zero impact on a selected CSA indicator, with  $\pm 10$  indicating a 100% change (positive/negative) and 0 indicating no change. Practices in the graphics have been selected for each production system key for food security identified in the study. A detailed explanation of the methodology can be found in Annex 3.



# Selected CSA practices and technologies for production systems key for food security in the Gambia



\*\* Unidentified production system area

## Case study: Agroecological approaches improved adaptation to climate change in the Gambia

During 2010-2012, farmers in the Gambia faced flash floods, periods of drought, disease infestation, saline intrusion, deforestation and massive erosion of their farmlands resulting in crop failure and reduced food security. In collaboration with local partners, ActionAid has introduced agroecological approaches including disaster risk reduction (DRR) and climate resilient sustainable agriculture (CRSA) to support smallholder farmers adapt to these shocks and to reduce vulnerabilities. A wide range of Interventions have been devised across the entire food production cycle to improve communities' resilience in a holistic manner. Among the common CRSA practices and applications are intercropping, mixed cropping, use and application of composting, introduction of open pollinated, traditional, early maturing seed varieties, mulching, use of botanical pesticides, provision of environmentally friendly farm implements and draught animals. Through a partnership and collaboration with the Ministry of Agriculture, ActionAid trained 11 Multi-Disciplinary Facilitation Teams (MDFTs) – government extension workers in the field - on CRSA practices to provide extension service support to farmers.

Project participants have reported an increase in food security and effective adaptation to climate change. 1267 smallholder farmers from 18 villages have been supported to become increasingly resilient for sustainable food security. There has been a tremendous increase on the number of smallholder farmers who are now practicing CRSA on their own. Seed and cereal banks created through the project has been a great contribution to resilience building. The physical structures provide safe storage facilities for farmers to keep their seeds and cereal away from animals, pest infestation and/or fire hazards. The availability of open pollinated, traditional, early maturing seed varieties enables farmers to have access to seeds at the crucial moment when the rains start. Combined with reliable weather information this also provides resilience when the onset of rains is less reliable. The banked cereal also enables access to cereal especially during lean period. In addition, reports from the communities indicate a huge expansion on the use and application of botanical pesticides as smallholder farmers have recorded positive adoption of this CRSA practice. It is easy to convince farmers and to adopt because it is inexpensive and is preventative, as opposed to chemical pesticides which are expensive and hazardous to the environment and people. Smallholder farmers do still use chemical fertilizers but many farmers within the project areas are now increasingly apply compost despite the challenges of providing sufficient materials to cover an entire farm at one go. In the long run, there is a trend towards elimination of chemical fertilizers as farm areas treated with compost or manure do not need to be fertilized every year.

Source: [21, 22]

**Table 1.** Detailed smartness assessment for top ongoing CSA practices by production system as implemented in the Gambia

CSA practice	Region and adoption rate (%) <30 30-60 60>	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars																
<b>Cereals (millet, maize, sorghum)</b> (30% of total harvested area)																				
Conservation agriculture (crop rotation, minimum/no tillage, cover crops)	Sahelian Zone 30-60%	S M		<p><b>Productivity</b> Increases the yield as a result of enhanced soil health and fertility. Reduces use of external inputs hence reducing production costs.</p> <p><b>Adaptation</b> Promotes soil structure conservation. Integrates crop residues and other on-farm waste. Minimizes erosion and enhances in-situ moisture.</p> <p><b>Mitigation</b> When rotating with leguminous crops allows long-term reduction in nitrogen-based fertilizers. Maintains or improves soil carbon stocks and organic matter content. Reduces GHG emissions attributed to ploughing.</p>																
	Sudan-Sahelian, Sudanian-Guinean Zone 30-60%	S M			Composting	Sahelian Zone 30-60%	S M		<p><b>Productivity</b> Increases productivity and income through greater product quality.</p> <p><b>Adaptation</b> Enhances soil bio-chemical and physical characteristics, hence improves water retention and long-term fertility.</p> <p><b>Mitigation</b> Reduces use of synthetic fertilizer, thus reducing related GHG emissions. Contributes to minimize methane emissions upon aerobic composting.</p>	Sudan-Sahelian, Sudanian-Guinean Zone 30-60%	S M	<b>Groundnut</b> (27.9% of total harvested area)					Integrated pest management	Sahelian Zone <30%	S M	
Composting	Sahelian Zone 30-60%	S M		<p><b>Productivity</b> Increases productivity and income through greater product quality.</p> <p><b>Adaptation</b> Enhances soil bio-chemical and physical characteristics, hence improves water retention and long-term fertility.</p> <p><b>Mitigation</b> Reduces use of synthetic fertilizer, thus reducing related GHG emissions. Contributes to minimize methane emissions upon aerobic composting.</p>																
	Sudan-Sahelian, Sudanian-Guinean Zone 30-60%	S M			<b>Groundnut</b> (27.9% of total harvested area)					Integrated pest management	Sahelian Zone <30%	S M		<p><b>Productivity</b> Ensures crop production and quality, hence potential increases in income.</p> <p><b>Adaptation</b> Prevents crop losses caused by pests and diseases. Increases the potential to overcome climate shocks.</p> <p><b>Mitigation</b> Increases carbon storage in soils. Reduces use of synthetic fertilizers and related GHG emissions/carbon footprint. Reduces GHG emissions attributed to ploughing. Reduces soil disturbance.</p>	Entire country <30%	S M				
<b>Groundnut</b> (27.9% of total harvested area)																				
Integrated pest management	Sahelian Zone <30%	S M		<p><b>Productivity</b> Ensures crop production and quality, hence potential increases in income.</p> <p><b>Adaptation</b> Prevents crop losses caused by pests and diseases. Increases the potential to overcome climate shocks.</p> <p><b>Mitigation</b> Increases carbon storage in soils. Reduces use of synthetic fertilizers and related GHG emissions/carbon footprint. Reduces GHG emissions attributed to ploughing. Reduces soil disturbance.</p>																
	Entire country <30%	S M																		



CSA practice	Region and adoption rate (%) <30 30-60 60>	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars
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**Groundnut** (27.9% of total harvested area)

Intercropping	Sahelian Zone 30-60%	S M L		<p><b>Productivity</b> Enhances production per unit area. Diversifies income and food sources.</p> <p><b>Adaptation</b> Promotes soil structure conservation and minimizes erosion. Contributes to spread crop failure risk.</p> <p><b>Mitigation</b> Allows long-term reduction in nitrogen-based fertilizers when leguminous are intercropped. Maintains or improves above- and below-ground carbon stocks and organic matter content.</p>
	Sudanian-Guinean Zone 30-60%	S M L		

**Rice** (16.6% of total harvested area)

System of rice intensification (SRI)	Sudan-Sahelian 30-60%	S M L		<p><b>Productivity</b> Enhances production per unit area.</p> <p><b>Adaptation</b> Reduces exposure to adverse climatic conditions. Promotes efficient management of rainwater and aeration of the soil.</p> <p><b>Mitigation</b> Reduces GHG emissions such as methane by minimizing periods of flooding. Can be integrated supplementary irrigation.</p>
	Sudanian-Guinean Zone 30-60%	S M L		

System of rice Intensification	Sudan-Sahelian 30-60%	S M L		<p><b>Productivity</b> Increments in yield due to the higher number of tillers and better grain quality.</p> <p><b>Adaptation</b> Promotes soil structure conservation. Reduces erosion and enhances in-situ moisture conservation.</p> <p><b>Mitigation</b> Reduces GHG –mainly methane– emissions from the rice fields.</p>
	Sudanian-Guinean Zone 30-60%	S M L		





CSA practice	Region and adoption rate (%) <span>&lt;30</span> <span>30-60</span> <span>60&gt;</span>	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars
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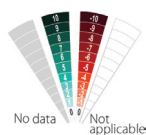
**Pulses** (3% of total harvested area)

Integrated pest management	Sahelian Zone <span>&lt;30%</span>	S M		<p><b>Productivity</b> Ensures crop production and quality, hence potential increases in income.</p> <p><b>Adaptation</b> Prevents crop losses caused by pests and diseases. Increases the potential to overcome climate shocks.</p> <p><b>Mitigation</b> Reduces use of synthetic pesticides and related GHG emissions and carbon footprint.</p>
	Entire country <span>&lt;30%</span>	S M		

Intercropping	Sahelian Zone <span>30-60%</span>	S M		<p><b>Productivity</b> Increases total production and productivity per unit area. Multiple crop harvesting increases income and food security.</p> <p><b>Adaptation</b> Crop diversification reduces the risk of total crop failure under unfavorable biotic and climatic conditions.</p> <p><b>Mitigation</b> Maintains or improves soil carbon stocks and organic matter content. Legume intercropping reduces the need of in nitrogen-based fertilizers.</p>
	Sudanian-Guinean Zone <span>30-60%</span>	S M		

**Sesame** (1.3 % of total harvested area)

Composting	Sahelian Zone <span>&lt;30%</span>	S M L		<p><b>Productivity</b> Increases in total production per unit area due to medium- to long-term reconstitution of soil fertility.</p> <p><b>Adaptation</b> Promotes soil structure conservation. Reduces runoff and erosion, enhances in-situ moisture conservation. Efficient use of local inputs.</p> <p><b>Mitigation</b> Increases Soil Organic Matter content. Reduces methane and other GHG emissions from manure and crop residues.</p>
	Sudanian-Guinean Zone <span>&lt;30%</span>	S M L		



CSA practice	Region and adoption rate (%)	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars
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**Sesame** (1.3 % of total harvested area)

Integrated pest management	Sahelian Zone <b>&lt;30%</b>	<b>S M</b>		<p><b>Productivity</b> Reduces production costs. Enhance crop production and quality, hence potential increases in income.</p> <p><b>Adaptation</b> Increases farmers' capacity to limit the crop exposure to crop damage caused by pests. Reduces the need for external inputs for crop protection.</p> <p><b>Mitigation</b> Reduces emission of GHG related with the use of pesticides, therefore reduced carbon footprint per unit of food produced.</p>
	Entire country <b>&lt;30%</b>	<b>S M</b>		

**Vegetables** (0.5% of total harvested area)

Composting	Sahelian Zone <b>30-60%</b>	<b>S M</b>		<p><b>Productivity</b> Promotes high yields per unit area hence an increase in income and profit due to reduced production costs.</p> <p><b>Adaptation</b> Improves soil health by increasing organic matter content and microbial activity. Long-term enhancement of bio-physical soil characteristics for of farming in degraded soils.</p> <p><b>Mitigation</b> Reduces requirements of synthetic fertilizers use, thereby related GHG emissions during its production and use. Conserves Soil Organic Matter (SOM).</p>
	Sudanian-Guinean Zone <b>30-60%</b>	<b>S M</b>		

Contour bunds	Sahelian Zone <b>30-60%</b>	<b>S M L</b>		<p><b>Productivity</b> Increased productivity per unit of land.</p> <p><b>Adaptation</b> Builds soil fertility by improving physical and bio-chemical soil characteristics. Reduces erosion and conserves moisture.</p> <p><b>Mitigation</b> Promotes carbon storage in soil. Water retention increases, which in turn reduces energy needs for irrigation, therefore reductions in related GHG emissions.</p>
	Entire country <b>30-60%</b>	<b>S M L</b>		



## Institutions and policies for CSA

The Gambia has several key institutions and policies aimed at supporting and increasing agriculture productivity and advancing CSA practices. The following graphic highlights key institutions whose main activities relate to one, two or three CSA pillars (adaptation, productivity and mitigation). More information on the methodology and results from interviews, surveys and expert consultations is available in Annex 5.

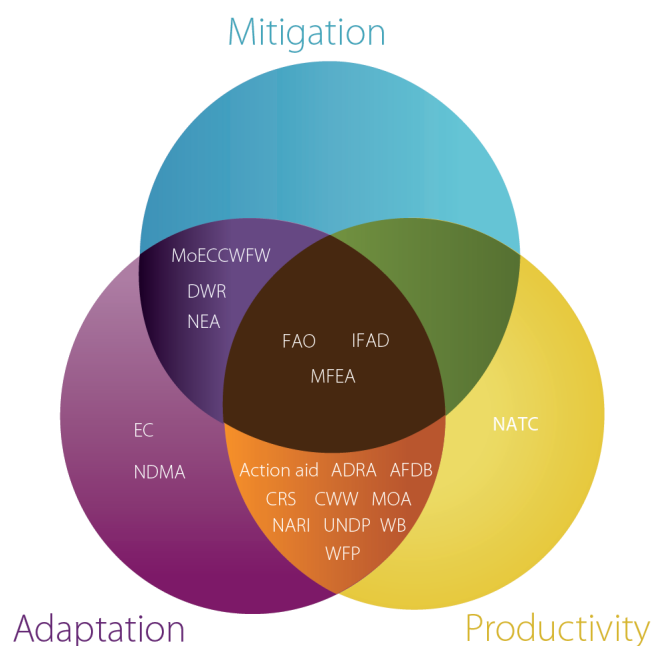
Many of the institutions that work on climate change and embrace CSA fall under the Agriculture and Natural Resources (ANR) sector and the Civil Society Organisations (CSOs). At the national level, the Ministry of Agriculture (MOA) is responsible for the agricultural sector comprising crops and livestock sub-sectors. Its primary roles are the formulation of appropriate agricultural policies and planning, and also monitoring and evaluation within the overall national development framework. Institutions engaged in climate change and CSA works are of three types: International development Partners in the UN Systems (FAO and WFP); ANR sector organisations and; CSOs. Institutions under the ANR sector are nine in number: Department of Agricultural Services (Extension, Food and Nutrition, Soil and Water Management, Agricultural Pest Management, Agricultural Communications, and Horticulture Units); Department of Livestock Services (DLS); Department of Planning (DoP); Agribusiness/ Co-operative; Department of Forestry; Department of Parks and Wildlife, Department of Fisheries; Department of Water Resources and the National Environment Agency (NEA). The CSOs include both international and local NGOs and Community-Based Organisations (CBOs). Those that are active in climate change work and CSA include ActionAid, United Purpose (UP, formerly known as Concern Universal), Catholic Relief Services (CRS), Njawara Agricultural Training Centre (NATC), Freedom from Hunger Campaign (FFHC), Wuli and Sandu Development Association (WASDA), Association of Food and Environmental Security (AFES), National Women Farmers Association (NAWFA), the Association for the Development of Women and Children (ADWAC), etc. The role of institutions in enhancing CSA in the Gambia could be threefold: funding/financing climate change and CSA; capacity-building and; project support.

The Gambia's National Agricultural Research Institute (NARI) seems to be the leading organization promoting CSA development and adoption in the Gambia by co-operating closely with other national and sub-regional programmes including: International Crop Research Institute for Semi-Arid Tropics; International Institute for Tropical Agriculture; Semi-Arid Food Grain Research and Development, and Africa Rice. The NARI conducts trials on high yielding and drought tolerant varieties of plants (crops) and their multiplication, Agroforestry systems and practices, pest and disease management.

NGOs and development agencies have also been active in supporting the uptake of CSA practices. Typically these NGOs concentrate on a particular activity such as seed multiplication and women's horticultural gardens. However,

many NGOs also provide general agricultural advice to the communities in which they work. Registered NGOs have formed an inter-NGO entity, the Association of Non-Governmental Organisations (TANGO). Co-ordination of governmental and NGO activities is the responsibility of the Advisory Committee for the Co-ordination of Non-Governmental Organisations (ACCNO). A wide range of projects across the country focus on enhancing the livelihoods of smallholder farmers and, because of the strong linkages between CSA and food security, many of these initiatives encompass climate risk management practices to some degree. For instance ActionAid through the Agro-ecology and Resilience Project (AERP) is working with smallholder farmers in eighteen communities in the Central River and North Bank Regions to help them cope with climate change related shocks. With many communities increasingly affected by drought, flash floods, erratic rainfall and rising sea levels, AERP is aimed at ensuring smallholder farmers have access to early warning information that will enable them make timely decisions on farming and farming practices.

### Institutions for CSA in the Gambia



ADRA Adventist Development & Relief Agency AFDB African Development Bank CRS Catholic Relief Services CWW Concern Worldwide DWR Department of Water Resources EC European Commission FAO Food and Agriculture Organization of the United Nations IFAD International Fund For Agricultural Development MFEA Ministry of Finance and Economic Affairs MoECCFWF Ministry of Environment, Climate Change, Water, Forestry and Wildlife MOA Ministry of Agriculture NARI National Agricultural Research Institute NATC Njawara Agricultural Training Centre NDMA National Disaster Management Agency NEA National Environment Agency UNDP United Nations Development Programme WB The World Bank WFP World Food Programme

In terms of policies, there is no specific policy on CSA in the Gambia. The approach is rather embedded in the Intended Nationally Determined Contributions (INDCs) and a draft climate change policy that is being processed for enactment by parliament. Objective 3 and 6 of this policy have clearly alluded to measures of CSA in the form of climate change adaptation and mitigation. In many countries including the Gambia, climate change policies that are reflective of CSA are expressed through the National Adaptation Programmes of Action (NAPAs) and the Nationally Appropriate Mitigation Actions (NAMAs). Since the 2000s, climate change adaptation has been developed mainly under the initial impulse of the United Nations Convention on Climate Change (UNFCCC), which mobilized the Ministries of Environment at the country level for implementation. Therefore, the thinking process on climate change has gradually been developed in this frame, leading to the development of the NAPAs. Other national instruments reflecting policy guidance and mandate of CSA are the Gambian National Agricultural Investment Plan (NAIP) 2 (in the making) as well as the Comprehensive Africa Agriculture Development Programme (CAADP) Compacts and the National Agricultural Strategy Plan (2016 – 2020). Below are some of the policy instruments been put into place, to cope with the challenges of economic development, poverty, food security and climate change in the Gambia:

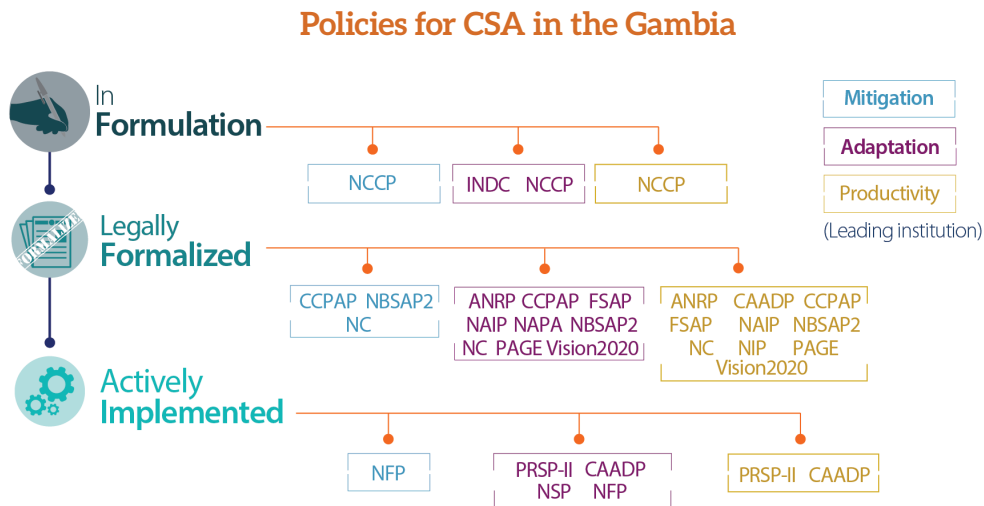
- Programme for Accelerated Growth & Employment 2012-2015 (PAGE). During the development of the Gambia's past development Framework PAGE 2012 – 2015, climate change concerns and issues were integrated in the framework and a costed Climate Change Action Plan was produced. The PAGE specifically makes references to and builds on the climate change implementation efforts and documents produced and submitted to the Secretariat of the Climate Change Convention, including the Gambia's First National Communication (FNC) in 2003 and the National Adaptation Programme of Action (NAPA) in 2007.
- National Adaptation Programme of Action (NAPA) - 2007: Building on the work from the FNC, the NAPA was developed in 2007 as the first strategic document to carry out a detailed vulnerability analysis for each sector with a sole focus of adaptation to climate change and building resilience. Ten (10) priority areas were identified within the NAPA and developed into fully costed projects. The Gambia's NAPA interacts with its flagship environmental management and poverty reduction strategies and entails a critical assessment of the role of climate change on societal and natural systems. Within the ANR sector, the following strategic directions were identified as adaptation measures; optimal use of natural resources, increasing and stabilizing crop productivity, making agriculture a profitable economic activity, stabilizing rural population. Transformational changes proposed for the existing animal husbandry practices include: rangeland management including the preservation of eco-assets, enhancement of animal productivity, easing constraints on livestock-based livelihoods. The fisheries sector strategies that address climate-induced changes in the aquatic ecosystems are based on optimal exploitation of fish reserves, reducing the demand and supply differences. The social welfare of fisher folk and the overall enhancement of the fisheries sector were also identified as strategic lines of action.
- National Climate Change Policy (NCCP) – 2016: This National Climate Change Policy (NCCP) was developed in 2016 at a time of accelerating global climate risks. The NCCP emphasizes the evidence of Climate change impacts in the Gambia, including increasing average temperatures and a rainfall regime that is decreasing in amount while increasing in variability. Different stakeholders in the Gambia have been implementing climate change responses on various fronts, such as climate resilient sustainable agricultural development, coastal ecosystem management, afforestation and reforestation, drought management, and social protection. The NCCP and ensuing National Climate Change Response Strategy and Action Plan provides a mechanism to harmonise and scale up climate resilient planning and implementation. Two out of the four strategic and integrated focal areas for priority policy intervention are identified as relevant to ANR and the CSA concept, as shown below:
  - Climate resilient food systems and landscapes: Agriculture, food security, forestry and natural resources, including water, biodiversity and wildlife
  - Low emissions and resilient economy: Energy, transport, infrastructure, and the key economic sectors of tourism and financial services.
- The Gambia National Agricultural Investment Plan (NAIP) - it is the medium term (2011-2015) strategic plan of the Government of the Gambia (GOTG) towards achieving the vision for the agricultural and natural resources (ANR) sector and food security in the country within the framework of the New Partnership for Africa (NEPAD)' CAADP. It is fully aligned with the national goals of Vision 2020, and supports the realization of main national strategic programmes, including the Poverty Reduction Strategy Paper II (PRSP II 2007-2011) and the Agriculture and Natural Resources Sector Policy (2010). The proposed interventions are expected to achieve at Least eight percent growth in the agricultural sector in the Gambia and this combined with accelerated non-agricultural growth could stimulate the level of growth needed in the sector to transform the country's rural areas and to significantly reduce poverty levels. The NAIP formulation process was highly consultative and participatory from the grassroots at village level to the highest level policy making body at national level through district, regional and national consultative meetings. There were also consultations with ECOWAS and its specialized institutions to ensure that the document is consistent with the CAADP pillars.



- National Communication (NC) to the UNFCCC - 2012: A Second National Communication (SNC) is developed as a follow up to the first NC, building on and continuing the Gambia's work under the UNFCCC. Under the SNC, the Gambia conducted and completed assessments on investment and financial flows (IEFF) to address climate change in the water, energy, forestry and agriculture sectors. Some CSA interventions prioritized in the NC for the agriculture sector include: selection of drought-, pest- disease-, and salinity-resistant, high-yield crop

varieties under local conditions; increase fodder production from intensive feed gardens; promotion of crop/livestock integration; improve feed conservation techniques and access to supplements etc.

The graphic shows a selection of policies, strategies and programs that relate to agriculture and climate change topics and are considered key entry points for CSA in the country.



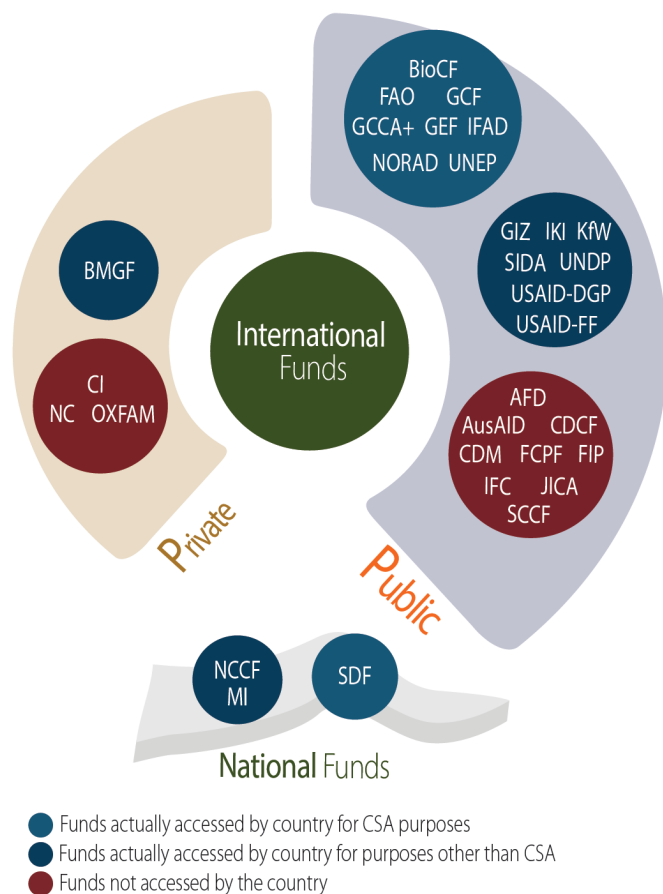
**ANRP** Agriculture and Natural Resources Policy (2009) (MoA) **CAADP** Comprehensive Africa Agriculture Development Programme Compact (2003) (MoA) **CCPAP** Climate Change Priority Action Plan (2012) (MoECCWFW) **FSAP** Fisheries Strategic Action Plan (2015) (MoECCWFW) **INDC** Intended Nationally Determined Contributions (2015) (MoECCWFW) **NAIP** National Agricultural Investment Plan (2011) (MoA) **NAPA** National Adaptation Programme of Action (2007) (MoECCWFW) **NBSAP2** National Biodiversity Strategy and Action Plan II (2015) (MoECCWFW) **NC** National Communication to the UNFCCC (2012) (MoECCWFW) **NCCP** National Climate Change Policy (2016) (MoECCWFW) **NFP** National Forest Policy (2010) (MoECCWFW) **NSP** National Seed Policy (2008) (MoA) **PAGE** Programme for Accelerated Growth and Employment (2012) (MFEA) **PRSP-II** Poverty Reduction Strategy Paper II (2007) (OP) **Vision2020** Vision2020 (1996) (OP)

## Financing CSA

Financing CSA activities in the Gambia is presently the prerogative of implementing agencies across the country. There are so far no concrete linkages with funding organizations at the bilateral and multi-lateral levels in support of CSA. There are, however, donor-supported climate change projects such as the Global Climate Change Alliance (GCCA) and the Global Environment Facility (GEF) that have supported CSA related initiatives implemented by United Nations Agencies and Civil Society Organizations (CSOs). International NGOs such as ActionAid and Concern Universal have invested in climate change-related projects. ActionAid primarily seeks to promote Climate Resilience Sustainable Agriculture (CRSA) that is almost the same as CSA. The European Union (EU) has supported the National Environment Agency (NEA) and the Department of Water Resources (DWR) with a 3-year project (The Global Climate Change Alliance Support Project) to the tune of three million Euros (€3M). It is also seeking to fund the 'Climate Change and Agriculture' Project to the sum of twenty

million Euro (€20M). In addition, the UN Environment is set to implement the largest natural resource development project in the history of the Gambia to help the West African nation tackle climate change impacts and restore degraded forests, farmland and coastal zones. Funded by a USD 20.5 million Green Climate Fund (GCF) grant and USD 5 million from the Government of the Gambia, the "Large-scale Ecosystem-based Adaptation Project in the Gambia" (EbA) was launched in January 2018 in the capital Banjul [22]. The government of the Gambia is expected to also benefit from other climate finance initiatives that can be used to support local efforts on climate change adaptation and mitigation. These windows of financial opportunities include the Climate Investment Fund (CIF) and the Global Environmental Facility (GEF).

## Financing opportunities for CSA in the Gambia



AFD French Development Agency AusAID Australian Agency for International Development BioCF World Bank BioCarbon Fund BMGF Bill and Melinda Gates Foundation CDCF Community Development Carbon Fund CDM The Netherlands Clean Development Mechanism CI Conservation International FAO Food and Agriculture Organization of the United Nations FCPF Forest Carbon Facility FIP Forest Investment Program GCCA+ Global Climate Change Alliance GCF Green Climate Fund GEF Global Environment Facility GIZ German Society for International Cooperation IFAD International Fund for Agricultural Development IFC International Finance Corporation IKI International Climate Initiative JICA Japan International Cooperation Agency KfW German Development Bank International Climate Initiative MICF Sp NC The Nature Conservancy NCCF National Climate Change Fund NORAD Norwegian Agency for Development and Cooperation SCCF Special Climate Change Fund SDF Ministry of Finance and Economic Affairs/ Social Development Fund SIDA Swedish International Development Cooperation Agency UNDP United Nations Development Programme UNEP United Nations Environmental Programme USAID-DGP United States Agency for International Development – Development Grants Program USAID-FF United States Agency for International Development – Feed the Future

## Potential Finance

The Gambia's INDC indicates the establishment of the Gambia Climate Change Fund (GCCF) as a priority for the country. All efforts need to be made to ensure that the Fund has a mechanism for directing finance towards agricultural adaptation and mitigation related projects, as well as supporting the country to monitor and track where

climate change funds are going and their impact. Another important aspect highlighted is the capacity building of stakeholders on the proper utilisation of climate change funds and in this regard special attention could be placed on capacity building stakeholders on climate-smart agriculture proposal design, implementation and monitoring to ensure both access to and efficient utilisation of agricultural climate change adaptation and mitigation finance. The need to engage private sector organisations (including microfinance institutes, agro-dealers, equipment manufacturers and buyers of agricultural produce) in CSA will also be important in terms of mobilising funds from all available sources. The INDC has already stated the desire of the Government of the Gambia to access the Green Climate Funds (GCFs) Private Sector Facility through engagement of the Gambia national Chamber of Commerce and Industry (GCCCI).

## Outlook

Agricultural production systems in the Gambia are vulnerable to climate change and variability. Lack of appropriate interventions will have disastrous consequences for the agricultural sector and national food security as well as on the livelihoods of the people. There are cases of the implementation of agricultural practices conforming to the principles and strategies of climate-smart agriculture and other sustainable agriculture practices. However, the large scale promotion of CSA adoption will hinge on (1) increasing public awareness on climate change adaptation and mitigation in agriculture particularly through the CSA approach; (2) mobilizing private funds at the international level to finance activities related to CSA; (3) encouraging collaborative research and development to develop locally appropriate CSA practices; (4) mainstreaming climate change into country agriculture and economic development policies; and (5) encouraging a multi-stakeholder approach to identifying and prioritizing the most applicable CSA practices for large scale adoption. Proper land use policies, adequate infrastructure development (including irrigation) and public-private partnerships (to encourage value chain and sustainable business environment for agricultural produce) and strict adherence to enacted policies and agricultural investment plans should be part of a wider strategy to economically reinvigorate the agricultural sector so that it can make a greater contribution to the country's food security while contributing to climate resilience and Green growth.

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For further information and online versions of the Annexes

**Annex 1:** the Gambia's agro-ecological zones

**Annex 2:** Selection of agriculture production systems key for food security in the Gambia (methodology and results)

**Annex 3:** Methodology for assessing climate smartness of ongoing practices

**Annex 4:** Long list of CSA practices adopted in the Gambia

**Annex 5:** Institutions for CSA in the Gambia (methodology and results)

**Annex 6:** Policies for CSA in the Gambia (methodology and results)

**Annex 7:** Assessing CSA finances

This publication is a product of the collaborative effort between the International Center for Tropical Agriculture (CIAT) – lead Center of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and The Food and Agriculture Organization of the United Nations (FAO) to identify country-specific baselines on CSA in West Africa (Benin, the Gambia, Niger and Côte d'Ivoire). The publication is based on data collected by FAO in collaboration with CSA stakeholders and partners in the Gambia and on previous work commissioned and led by the World Bank Group to identify country-specific baselines and entry points for scaling out CSA, through data analysis and series of dialogues with national stakeholders. The work complements the CSA Profiles series developed since 2014 by the World Bank, CIAT and CCAFS for countries in Latin America, Asia, Eastern and Central Europe, and Africa (<https://ccafs.cgiar.org/publications/csa-country-profiles>).

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