



**CLIMATE CHANGE  
AND  
AGRICULTURE IN AFRICA**

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## EDITOR'S NOTE



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It is with great pleasure that I present the twenty-first issue of the Sahel Quarterly focused on the impact of the changing climate on the African agricultural sector.

The objectives of this issue are three fold: 1) to raise an alarm on the food crises and conflicts confronting the continent as a result of climate change, 2) to call to action the various stakeholders in the sector including governments, non-profit organizations, private companies and INGOs - and to encourage them to develop mitigation strategies to curb the impact of climate change in the sector, and 3) to showcase the various innovations and initiatives being implemented across the world to curb the challenges of climate change, in order to spur greater collaboration for the scaling of high-impact interventions.

The 2018 Global Report on Food Crises highlights that three out of the four conflict-affected areas that are “at risk of famine” in the world are in Africa - South Sudan, Somalia, and Nigeria (Northern Nigeria). There are several factors causing the limited food supply, however, one of the least emphasized is climate change. Unpredictable rain patterns create production uncertainties with farmers therefore resulting in limited availability, accessibility and affordability of food in Africa.

Despite these challenges, only few African countries are at the forefront of developing innovative approaches such as establishing climate smart agricultural practices to curb climate challenges.

There is an urgent need for the various stakeholders in the sector to collaborate and provide a supportive ecosystem to improve access to affordable and nutritious food in Africa. African governments can build this ecosystem through the development and implementation of specific and targeted policies that promote Climate Smart Agricultural Practices.

Some key instruments have been developed to curb these challenges, including the use of greenhouses, innovative irrigation systems and the development and adoption of stress resilient seeds. International funding sources such as the Green Climate Funds are also being leveraged to build resilience against the effects of climate change.

It is my hope that this Quarterly will build the momentum required to drive behavioural changes and propel the urgent action required to ensure that Africa is more resilient to the effects of climate change.

### *Contents:*

Climate Change in Africa – A Bigger Issue than We Realize? .....	3
Impact of Climate Change on AFRICA’S Agriculture Sector.....	4
Climate Finance and Insurance for Agriculture .....	7
Climate Smart Agricultural Practices.....	9
Climate Change Adaptation Programs.....	11
Country Spotlight: International Best Practices .....	12

# CLIMATE CHANGE IN AFRICA

## – A BIGGER ISSUE THAN WE REALIZE?

Of the ten countries considered most threatened by climate change globally, seven are in Africa (Figure 1). Given the recent devastations from flooding, droughts, desertification and conflicts across the continent, African governments have increasingly expressed concern about the impact of climate change. There was also a large African delegation at the Conference of Parties, ‘COP21’ in Paris in 2015, where the Paris Agreement was developed.

By April 2016, forty-seven African countries had signed the agreement, committing to take concrete actions to mitigate and adapt to climate change. However, only few African countries are actively working toward meeting their targets. Alarming, as of December 2018, the Climate Action Tracker reported that only three African countries: Ethiopia, Morocco and South Africa were taking the lead toward developing policies to meet the objectives of the agreement.

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) presents strong evidence that warming in Africa has increased significantly over the past 50 to 100 years, with clear effects on the health, livelihoods and food security of its people. For example, Lagos, Nigeria, experienced heavy rainfall in January 2019, an anomaly, as the event occurred during the dry season, which typically runs from October through March. Similar changes in traditional seasonal patterns have become more frequent in the past few years. This is only one of the many effects of climate change, a long-term change in seasonal patterns due to an increased accumulation of greenhouse gases released in the atmosphere through the burning of fossil fuels<sup>1</sup>.

Similar effects are increasingly being noticed around the world, including rising global average temperatures and sea levels, an increased variability in weather patterns and extreme weather events.

Many African countries have experienced severe flood disasters in recent years. In 2000, the Limpopo Valley floods were one of the worst flood disasters in Mozambique’s history responsible for at least 700 deaths and displacing up to 650,000 people. It was estimated that the

**7 of 10**  
countries considered most threatened by  
climate change globally are in Africa.



**African countries most vulnerable to the impacts of climate change**

total cost of the floods was up to 20 percent of the country’s GDP, slowing down its economic growth rate by 2.1 percent. Mozambique continues to suffer severe floods till date. In March 2019, Cyclone Idai devastated parts of the country, wiping out almost 715,000 ha of farmlands, which accounts for 13 percent of its total agricultural land area, and affecting 500,000 farming households. The cyclone also placed 1.85 million people in need of aid and claimed more than 500 lives. Current funding needs in response to the cyclone is estimated at \$282 million<sup>2</sup>.

Cyclone Idai also affected parts of Malawi and Zimbabwe, with an estimated 50 percent of crops lost in Southern Malawi. In Zimbabwe, at least 181 deaths were reported while a total of 270,000 people were affected.

The 2019 floods in Malawi, Mozambique and Zimbabwe have also led to an increasing outbreak of waterborne, vector borne and skin diseases with reported cases of cholera and acute respiratory tract infections affecting thousands of people<sup>3</sup>. These recent crises reinforce the need for urgent action by all stakeholders.

For Africa, with its burgeoning population, the cost of ignoring the effects of climate change will become even more devastating in future if urgent action is not taken. According to the Sustainable Development Goals Report 2018, climate change is a major contributing factor leading to growing hunger, forced displacement of people, limited universal access to basic water and sanitation, and the loss of lives, properties and homes in Sub-Sahara Africa. Food security will

increasingly become a major challenge due to an increase in severe droughts, floods and storms threatening the health of populations and economies.

Due to its increasingly devastating effects, African governments need to urgently prioritize climate change intervention in order to minimize the irreversible impact it is having on their economies, population and environment.

## IMPACT OF CLIMATE CHANGE ON AGRICULTURE IN AFRICA

The agriculture sector contributes to and is impacted by climate change given its role in the release of greenhouse gases into the atmosphere and also its vulnerability to climatic conditions. Agriculture contributes 10-12 percent of total annual greenhouse gas – methane - emissions globally. The effects of climate change on the African agricultural sector include biodiversity loss, limited land and water resources, declining agricultural productivity of crops, livestock and fisheries and poor economic development.

### Impact of Climate Change on Economic Development

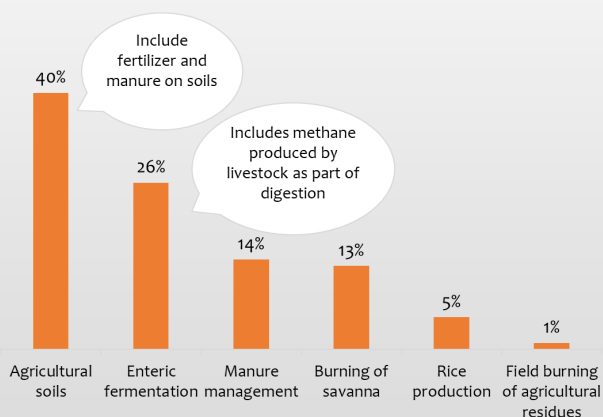
African countries are disproportionately impacted by climate change given the heavy reliance of their economies on the agriculture sector, which employs two-third of their workforce and accounts for, on average, one-third of their

GDP. Countries such as Chad, Niger and Zambia could lose their entire farming sector due to climate change by 2100<sup>4</sup>. In addition, according to the Department for International Development (DFID), climate change could cost Nigeria, the second largest economy on the continent, between 6-30 percent of its GDP worth \$100billion-\$460 billion by 2050<sup>5</sup>.

### Impact of Climate Change on Land and Water Resources

**Land degradation:** Approximately 35 percent of land across West Africa is under threat of desertification especially in the north where land degradation and climate change have exacerbated poverty. For example, Northern Nigeria is under severe threat of desert encroachment with sand dunes becoming common geological features in states like Borno, Jigawa, Katsina, Sokoto and, Yobe, burying large areas of arable lands and grazing rangelands and limiting agricultural production.

Total Agricultural Emissions by Category in Africa



“Other African countries such as Cameroon registered a loss of ½ of its total forest area (12Million Ha of degraded and deforested land)”

The African wet tropics (West Africa and the Congo Basin) contain the second largest area of tropical rainforest in the world, accounting for roughly 30 percent of global rainforest cover, a reservoir of biodiversity. However, countries in the region are losing their forests and land as a result of climate change.

**Water Resources:** Africa's agricultural sector is largely dependent on rainfall, and there is limited dry season production and minimal use of irrigation systems among smallholder farmers. The United Nations predicts that access to water will be the single biggest cause of conflict and war in Africa in the next 25 years. For example, the loss of 90 percent of Lake Chad<sup>7</sup> has contributed to the displacement of tens of thousands of people and is causing significant harm to fishing, grazing of livestock, and crop lands in the area<sup>6</sup>.

### Impact of Floods in Nigeria - 2018

Between 2017 and 2018, Nigeria experienced floods with continuous rainfall from July to September 2018. The rains caused severe flooding across 34 out of 36 states in the country. Some impact of the floods include:



Affected **441,250 people**



Displaced **141,400** people in Adamawa, Anambra, Bayelsa, Benue, Delta, Edo, Kebbi, Kogi, Kwara, Niger, Rivers, and Taraba states (August 2018)



Caused **108 deaths** and **192 injuries** in 12 states and 50 Local Government Areas (LGAs) in central and southern Nigeria



Destroyed an estimated **122,650 hectares** of agricultural land across central and southern Nigeria.

Source: ACAPS Briefing Notes, 2018

### Climate Change and Crop production

Agricultural productivity is hinged on several factors including the availability of conducive land, the use of adequate inputs and weather conditions.

**Unpredictable Weather Conditions:** Nearly 93 percent of agriculture in sub-Saharan Africa is rainfed, however, the rainy season has become unpredictable in the recent years with early and late rains. This has distorted the current production calendar of smallholder farmers, who have limited access to information to plan and prepare adequately.

In West Africa, January is considered a dry season. However, as at January-February 2019, there have been heavy rain downpours in parts of the region.

The start-date and duration of the raining season has become less predictable for crop farmers whose activities are dependent on the rain calendar. This raises concerns about the productivity of farmers and the impact this will have on the availability, quality and price of the produce this year. The Nigerian Meteorological Agency (NiMet) has already forecasted 'lower-than-normal rainfall' across most parts of Nigeria in 2019 with an expected late start of rains in the north<sup>9</sup>. The unpredictable rains and continuous loss of agricultural produce will strain the output, deepen poverty and malnutrition among smallholder farmer households and lead to a deficit in supply of the food products for the wider population.

**"The total area cultivated for rice farming in Nigeria is estimated at 3.3 Million Ha, of which only 25% is used for dry season production while 75% is dedicated to rain-fed production. The current uncertain rains leave the farmers in Nigeria more vulnerable and susceptible to low production output."** - Sahel Research, 2018

Agricultural yields are susceptible to weather conditions. As the climate becomes even more extreme, with frequent droughts, unpredictable weather patterns and rising temperatures, Africa will face declining crop yields and will struggle to produce enough food for domestic consumption. The table below illustrates the projections for climate change impact on crop production in 2030 as a percentage of 1998 to 2002 yields<sup>7</sup>. For instance, in West Africa, maize production is projected to decrease by 9.64% by 2030 due the impact of climate change.

**Projected impact of climate change on production in 2030 as a percentage of 1998 to 2002 yields<sup>10</sup>**

Production Impact in %	West Africa		Sahel Region		Central Africa		Eastern Africa		Southern Africa	
	Worst	Best	Worst	Best	Worst	Best	Worst	Best	Worst	Best
<b>Rice</b>	-5.92	0.75	-6.62	-3.70	-6.52	1.23	-3.24	12.27	0.39	12.05
<b>Maize</b>	-9.64	1.09	-6.79	7.42	-4.18	0.70	-5.78	4.42	-46.56	-12.27
<b>Millet</b>	-4.33	6.17	-2.86	12.46	-34.17	0.77	n/a	n/a	n/a	n/a
<b>Sorghum</b>	-5.51	4.65	-15.33	6.18	-16.69	5.56	-7.17	6.23	-16.86	14.66
<b>Cassava</b>	-2.95	4.71	n/a	n/a	-2.89	2.01	-5.63	8.33	-2.91	3.93

“In Malawi for instance, it is estimated that half of the rural population of approximately 6.7 Million people, are receiving food aid after two consecutive years of drought. In addition, the food prices are at 172% above the 5-year average prices. ”

**Limited Stress Resistant Crops:** African countries have a low track record for developing and adopting resilient crops. Although a few have been released in some countries including maize, beans and potato, there is still limited research, development and adoption of adequate drought resistant crops by smallholder farmers. National and International research institutes are leading the research efforts on stress resistant crops, however, there is still limited investment to support the development and dissemination of drought tolerant crops and ensure adoption by farmers.

### Climate Change and Livestock Production

The dominant livestock production model in Africa is the nomadic pastoralist system. The increasing land degradation as a result of drought is limiting access to rangeland for grazing. This has increased the level of migration leading to mass destruction of crop farms and social conflicts. Factors that further compound the challenges of livestock production include limited water access and fragmentation of grazing areas.

In several African countries including Nigeria, Niger, Ghana, Mali, Senegal, there have been growing clashes between farmers and herdsmen resulting in death and hampered productivity of the agricultural sector. In Nigeria for instance, Mercy Corps reports that Nigeria could gain up to USD13.7Billion annually<sup>11</sup> in total macroeconomic progress in a scenario of peace between farmers and pastoralists in Benue, Kaduna, Nasarawa, and Plateau States alone.

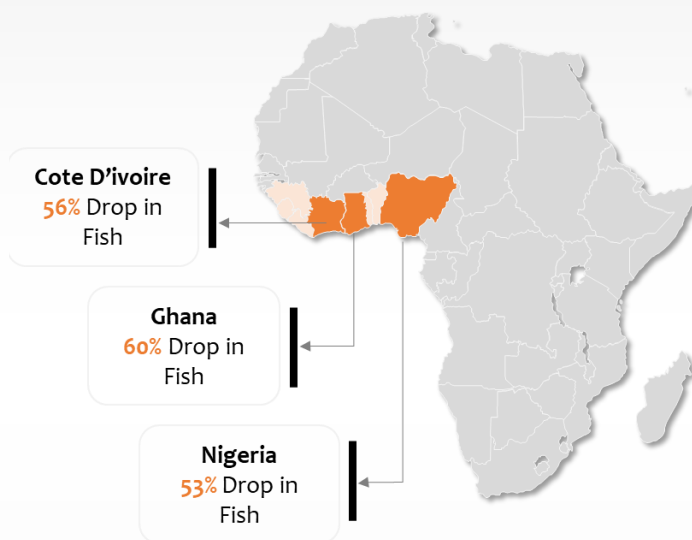


### Climate Change and Fisheries

Globally, it is projected that climate change will reduce fish supply by 7.7 percent and reduce revenues from by 10.4% by 2050 under a high CO2 emissions scenario.

In Africa this decrease in the fish supply may be as high as 56 to 60 percent in parts of West Africa due to over-fishing and compounded by climate change. Rising sea temperatures, making fish stocks migrate toward colder waters away from equatorial latitudes, and contribute to shrinking fish sizes<sup>11</sup>. It is estimated that up to the 12Million people who are engaged in the fisheries sector in sub-Sahara Africa are at risk of losing their livelihoods.

Drop in Fish Supply in Major Countries by 2050



The current challenge of limited food supply buttressed by the various impact of climate change including the declining crop yields, limited agro-ecological resources and conflicts will further reduce food production output and result in high food prices. In effect, the FEWSNET 2019 Needs Assessment estimates that 83 million people across 46 countries, majorly in Africa, will require emergency food assistance, a 75 percent increase since the “zero hunger” Sustainable Development Goal was set in 2015<sup>12</sup>. There is an urgent need to develop mitigating strategies to foster food availability, affordability and accessibility in Africa.

# CLIMATE FINANCE AND INSURANCE FOR AGRICULTURE

Climate finance for agriculture aims to increase investments directed at reducing agriculture greenhouse gas (GHG) emissions and at improving food systems' resilience. In order for the continent to effectively mitigate and adapt to climate change, funding levels must increase, as must smallholder farmers' access to and adoption of adequate climate finance instruments, including insurance.

## Increasing African Countries' Climate Finance Funding Levels

Most African countries do not have country plans addressing climate change, nor do they have adequate financial resources allocated to it. Instead, they depend for the most part on external funding. For instance, as part of the Conference of Parties (COP)<sup>21</sup> Paris Agreement, Western nations, multilateral development banks and private financial institutions pledged to scale up climate funding to at least \$100 billion annually beginning in 2020 to help developing nations build their resilience to climate change. The pledged funds will be managed by the Green Climate Fund (GCF) and the Global Environment Facility (GEF). The GCF for instance finances both climate adaptation and mitigation projects, with African countries representing 42 percent of its priority countries<sup>13</sup>. Nevertheless, despite the significant funds committed, allocations to Africa's agriculture may not be sufficient to meet the continent's climate change adaptation and mitigation needs. According to the United Nations Environment Programme (UNEP), Sub-Saharan Africa alone is estimated to require \$50 billion per year by 2050 for adaptation finance under an optimistic 20°C global warming scenario. UNEP estimated that even if adaptation funding for Africa meets adaptation costs by 2020, annual funding would need to further increase by 7 percent each year thereafter to meet the adaptation challenge implied by warming levels beyond the 20 Celsius initially forecasted<sup>14</sup>.

The ability to unlock additional funding is critical but is only possible if African governments can foster an enabling environment that attracts more private capital and investments in low-emission, climate-resilient development.

To that end, African governments can leverage international sources of climate finance to build their internal capacity and involve the private sector. The Green Climate Fund's Readiness and Preparatory Support Programme<sup>15</sup> for instance, aims to improve target countries including African States' ownership and access to funds through grants and technical assistance. Key focus areas include strengthening countries' capacity, engaging stakeholders in consultative processes, providing access to finance, and mobilizing the private sector.

Carbon markets are another potential source of climate finance available to African countries. The World Bank's Carbon Finance Unit for example, uses contributions from governments and companies in OECD countries to purchase project-based greenhouse gas emission reductions in developing countries. Nevertheless, the lack of robust tracking systems and growing concerns regarding carbon markets' effectiveness at significantly reducing emissions is limiting their relevance.

## Increase climate finance support given to smallholder farmers

Smallholder farmers are one of the most vulnerable groups affected by climate change. In addition to attracting additional climate finance funding, African governments need to direct more efforts at improving farmers' access to and adoption of financial instruments aimed at improving their resilience to climate change and to its effects.



These instruments include the following:

- **Weather Index Insurance:** is an adaptation measure aimed at protecting smallholder farmers against the impact of climate change by allowing them to use high-risk but higher production crop varieties. Farmers get a pay-out when the index flags a major weather risk such as a drought or flood. A key challenge in its application in Africa is the availability of accurate local weather data over a reasonable historical period to enable insurance companies to have enough adequate data from previous droughts/floods to analyze probabilities and calculate index insurance prices.
- **Yield Based Agriculture Insurance:** is a crop insurance, which covers unavoidable production losses caused by natural disasters such as drought, wind, flood, excessive temperature during pollination, etc. Farmers can get crop-yield insurance where they are covered against a yield guarantee based on their historical production levels. They can also get crop-revenue insurance, which combines crop-yield insurance and decline, in prices during the growing season.

Moreover, farmers can be provided with agricultural loans and grants specifically targeted at increasing their ability to procure and use resilient crop input varieties, which are more expensive than regular varieties. They can also be supported to access services such as early warning systems to get more accurate weather forecasts to inform farming decisions. IFAD's Adaptation for Smallholder Agriculture Programme (ASAP)<sup>16</sup> for instance, is the largest global finance source dedicated to supporting smallholder farmers' adaptation to climate change. Its scope includes improving farmers' access

to and adoption of climate risk management skills, information and technology and innovative approaches to sustainable land and water management. During its first phase (2012 to 2017), the program disbursed \$300 million through grants to 43 countries and helped 8 million smallholder farmers build more resilient livelihoods. The second phase, projected at \$100 million, seeks to leverage IFAD investments to attract additional co-financing for climate change adaptation. It will enable climate mainstreaming through technical assistance and capacity building in cooperation with governments, research institutes, farmer organizations and civil society. It aims to benefit 10 million smallholder farmers.

Finally, more cost effective and demand-driven financial instruments are needed to better meet the needs of smallholder farmers, particularly women who are disproportionately affected by climate change. To that end, African governments should foster the development of a strong ecosystem of services needed to support climate mitigation and adaptation strategies for agriculture. These include weather and climate data collection services to capture local weather variations and effectively inform risk models on which to build better agriculture insurance products; fund research around weather resistant crop varieties, and land management. Financial institutions interested in targeting farmers should also invest to better understand the agriculture sector in order to improve their ability to manage and price risks. In addition, technology provides an opportunity to reduce transaction costs, providing a new delivery channel to reach farmers at a larger scale through these instruments.

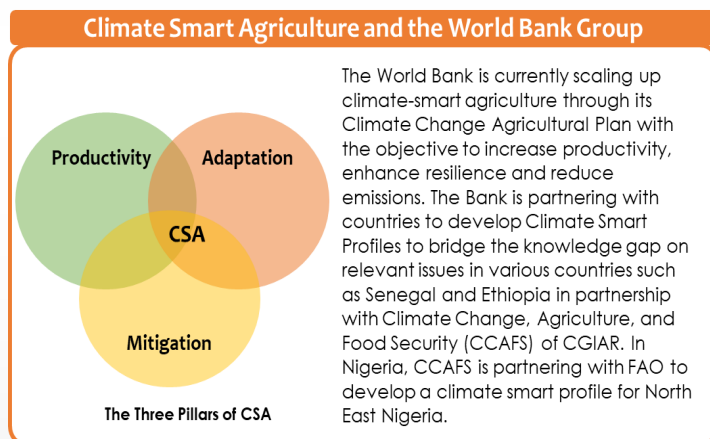


# CLIMATE SMART AGRICULTURAL PRACTICES

Climate resilient agricultural practices limit the negative effects of climate change and enhance food security through increased adaptation of crops to extreme climatic conditions.

Adaptation is not accomplished in a single intervention. Rather, it is a continuum, requiring an overarching approach that incorporates interventions that range from those that address underlying drivers of vulnerability to those designed exclusively to respond to the impact of climate change.

Globally, significant efforts are being channelled towards the development of climate resilient innovations and adaptive strategies to curb the impact of climate change on the agriculture sector.



However, the adoption rate remains slow due to challenges such as high cost of the innovations and technologies, limited research and development and low capacity building and advocacy. Some of the practices include the adoption of resilient seeds, climate smart greenhouses, irrigation systems, and innovative weather data collection and forecasts systems.

## Drought Resilient Crop Varieties

The research centers and programs of consultative Group for International Agricultural Research (CGIAR) are leading the charge towards the development of stress resistant crop varieties that allow smallholder farmers to sustainably produce food despite extreme climate variations. Some interesting initiatives include the following:

[www.sahelcp.com](http://www.sahelcp.com)

- **Drought Tolerant Maize for Africa Project:** Implemented by the International Maize and Wheat Improvement Center (CIMMYT), and the International Institute of Tropical Agriculture (IITA), over 200 stress tolerant maize varieties were released in 13 countries in Africa between 2010 and 2016 under the project. The stress tolerant maize varieties have the potential to increase productivity and reduce yield variability. Based on on-farm trial results, climate resilient maize varieties produce up to 20 percent increase under drought and stress prone conditions.
- **The “Magic Beans” in Malawi:** Malawi suffered its worst drought in 30 years in 2016, due to climate change. While most of the maize fields experienced severe losses due to the effect of drought, a beans variety developed by the International Center for Tropical Agriculture (CIAT) thrived. As a result of its resistance to drought, local farmers dubbed the beans variety the “magic beans”. CIAT developed the beans to mature early in 60 days rather than the normal 90 days to ensure that it is ready for harvest before the periods of severe drought commenced. The beans also have longer roots which helped the variety reached water deeper in the soil. Trials showed that the beans yielded 1,050 kg per hectare, which is 262.5 percent higher than the average yield of 400kg per hectares for beans in the country<sup>17</sup>.

## Greenhouse Systems

Greenhouse farming is a climate smart technology used to improve productivity while reducing greenhouse gas emissions and impact on climate. Greenhouses are structures with controlled systems used to grow crops with the efficient use of fertilizer, chemicals and minimal soil disturbance, some major contributors to greenhouse gas emission in agriculture. Some key materials used for greenhouses include polythene, polycarbonate or nets. The role of the structure is to grow crops indoors protected from unstable atmospheric conditions such as temperature, relative humidity, sunlight and unwanted pests.

Compared with open field crop production, greenhouses generate higher returns per unit production area, eliminate production seasonality and ensure high quality of crops. In greenhouses, farmers control key production variables including temperature, the amount of light, the system of irrigation, fertilizer application and the atmospheric humidity, to get optimum growth and productivity.

Greenhouses are not affordable for most smallholder farmers and are commonly used by commercial farms. A unit of the 192 square meter greenhouse costs about USD5,500 while the 384 square meter greenhouse costs between USD8,000 to USD11,000 to install.

To facilitate access to greenhouses and improved productivity, cost effective and innovative greenhouse systems have been developed for smallholder farmers in Africa.

- **The Children and Youth Empowerment Center (CYEC)**<sup>18</sup> in Nyeri, Kenya, in partnership with the Humanitarian Engineering and Social Entrepreneurship (HESE) Program at the Pennsylvania State University, developed the “high



tunnel or Affordable Greenhouse” technology to support farmers to grow crops all year round. The system is dubbed an affordable greenhouse due to its low material cost of approximately USD200. It is easy to build, and farmers can install drip irrigation systems to reduce crop water requirements by up to 50 percent compared with production in open fields.

- **PS Nutraceuticals Limited**, a private organization in Nigeria, has developed a low-cost greenhouse made with bamboo due to the prohibitive nature of the cost of greenhouses for smallholder farmers. At approximately



USD850, a 400 square meter bamboo greenhouse is more cost effective than the commercial greenhouse that costs about USD5,500.

## Irrigation Systems

Irrigation systems and other forms of agricultural water management systems are critical to building resilience and adaptations to climate variability. However, given the high costs of conventional irrigation systems, and the effect of climate change on the rural populations in Africa, adopting cost effective and convenient irrigation solutions is key to improving livelihoods.

**Small-Scale Irrigation Systems:** Small-scale irrigation systems are a range of technologies and practices aimed at capturing, storing and distributing water in small farms. Small-scale irrigation is increasingly being used by smallholder farmers in Africa to cultivate their farmlands, including:

- **Manual Water Pumps for Small Scale Irrigation (By KickStart International):** KickStart, a social enterprise, markets the pedal pump, a portable and mobile irrigation technology developed as a modified version of the Asian treadle pump in Bangladesh. Nicknamed the "Moneymaker", the Pedal Pump costs about USD70 and is sold in several villages in Kenya. The pump has the capacity to pull water from a depth of 23 feet (7m) and can be used to expand the current area under irrigation by 50 percent. Irrigation systems are purchased by the rural poor and have enabled 900,000 people out of poverty and increased farmers' total net-annual farm income by over 400 percent<sup>19</sup>.
- **Bottle Drip Irrigation (Introduced by the Uganda Government):** The bottle drip irrigation is a controlled form of irrigation in which plastic bottles are used to trickle water slowly to the roots of a plant over a long period of time.



This system is promoted in Uganda and agricultural experts have acknowledged that this system reduces water loss by up to 60%. This irrigation technique is effective although farmers in Eastern Uganda affirmed that the system is exhausting, especially when water sources are far from the farm plots.

Several programmes and organizations are introducing small-scale irrigation systems:

- **Adapting Irrigation to Climate Change Project (AICCA):** Funded by The International Fund for Agricultural Development (IFAD) and implemented by FAO, the project focuses on improving the sustainability and adaptation of small-scale irrigation systems in West and Central Africa. In 2017, the first phase of the project

focused on regional analysis of the implications of climate change on irrigated agriculture in eight countries - Chad, Côte d'Ivoire, Gambia, Mali, Liberia, Mauritania, Niger and Sierra Leone. It also highlighted the irrigation technologies and best practices adapted to climate shocks that are valuable to scale up. The second phase is focusing on four pilot countries - Côte d'Ivoire, Gambia, Mali and Niger. An in-depth analysis is being conducted in each country to assess the impact of climate change on irrigation systems in order to propose adaptation strategies.

## CLIMATE CHANGE ADAPTATION PROGRAMS

There is an urgent call for action to strengthen the continent's adaptation and resilience to climate change as it threatens to impoverish millions of Africans by 2030 and undo the development gains over the past decade. Programs focused on agroforestry, climate smart agriculture, food production diversification, social protection mechanisms, and agriculture technology have the potential to build the resilience of smallholder farmers and rural populations to climate extremes and shocks<sup>19</sup>.

### International Committee Agreements

**Paris Agreement:** The Paris agreement is built under the UNFCCC to combat and adapt to climate change effects through targeted strategies to keep global temperature rise to below 2 degrees Celsius and limit increasing temperature to 1.5 degrees Celsius. However, as at December 2018, the Climate Action Tracker reports that only three African countries, with Ethiopia and Morocco taking the lead, have made progress toward developing and implementing policies to meet the objectives of the Agreement. South Africa is the third country with slower progress but higher than every other African country.

**United Nations Framework Convention on Climate Change (UNFCCC):** Is a global environmental treaty adopted in 1992 and kicked-off in 1994 after ratification by 197 countries. The Convention's objective is to achieve the stabilization of greenhouse gas concentrations in the atmosphere to a level that prevents interference with the climate system. As of 2015, all United Nations member states are parties to the UNFCCC and is supplemented by the Kyoto protocol and Paris Agreement.

The international community has been active in developing solutions to mitigate the challenges of climate change in Africa through the UNFCCC and the Paris Agreement.

Furthermore, there are key initiatives on climate adaptation policies and mitigation measures in Africa led by key actors in

the landscape.

### The World Bank Climate-Smart Agriculture (CSA) Country Profile Series

CSA Country Profile Series is a collaborative effort by the International Center for Tropical Agriculture (CIAT), the CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS), the World Bank and the UK Government's Department for International Development (DFID). The initiative analyses the challenges and solutions of climate change in agriculture in 33 countries across, Africa, Asia, Latin America and Caribbean (LAC). The country profiles are created to inform strategies that will improve livelihoods, reduce emissions and increase resilience of the agriculture value chains, providing a detailed guide for large-scale agricultural investments.

Over 16 countries have been assessed and profiled in Africa, 7 in Asia and 10 in LAC. African countries profiled to date include Benin, Cote D'Ivoire, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mali, Mozambique, Niger, Rwanda, Senegal, Tanzania, The Gambia, Uganda, Zambia and Zimbabwe. The table below highlights the insights from the country profiles on climate smart technologies, the strength and weaknesses of farming:

CCAFS research activities on Climate Smart Agriculture has resulted in additional funding for climate smart programmes across different regions.

The World Bank is financing a program inspired by the Climate Smart Village Model in Niger with the objective to increase agricultural productivity and enhance drought resilience of agro-pastoral system in 60 targeted communes in Niger. The project also focuses on delivering ‘the triple win of climate-smart agriculture: improving productivity, building resilience and reducing emission in selected locations in Niger’. The

project, worth USD 111 million, is implemented by 3N (Nigeriens Nourish Nigeriens) High Commission of Niger for seven years (2016 to 2023)<sup>20</sup>.

In addition, the world Bank, in January 2019, launched the Action Plan on Climate Change Adaptation and Resilience to increase climate finance for direct adaptation to \$50 billion over FY21-25.

Technologies considered climate-smart are highly diverse with over 1700 unique combinations of production systems, regions and technologies assessed.

Despite the diversity just five technology clusters (water management, crop tolerance to stress, intercropping, organic inputs, and conservation agriculture) account for almost 50% of CSA technologies.

Over two-thirds of all technologies in the completed global synthesis apply to food crops such as maize, wheat, and rice or cash crops.

Most technologies considered climate-smart demonstrate synergies between productivity, adaptation, and mitigation pillars, revealing opportunities for co-benefits and potential triple wins.

One of the key limitations of country profiles is their focus on singular interventions, rather than integrated packages of technologies, and focus on on-farm technologies as opposed to broader value chains or

The single largest barrier to CSA adoption across all regions was capacity needs in the form of training and information, affecting almost 90% of all interventions.

The smartness of a given CSA technology is dependent on context, and can vary considerably between different production systems and locations.

CSA technologies with the highest smartness scores are not always widely prioritized by experts and widely identified technologies do not always hold the highest smartness scores.

#### Insights from CSA Country Profiles across Africa, Asia and Latin America

## COUNTRY SPOTLIGHT: INTERNATIONAL BEST PRACTICES

Some countries around the world are at the forefront of developing and adapting innovations and strategies to mitigate the impacts of climate change. They include Israel, Netherlands, Ethiopia, and Ghana.

### Israel

In a bid to build a climate resilient economy, the Israeli Climate Change Information Center (ICCIC) was set up by the country's Ministry of Environmental Protection in 2011 to implement the national climate change adaptation programme<sup>21</sup>.



A key policy direction of the Israeli government on agricultural irrigation targeted at making the country climate resilient is to heavily subsidize the consumption of water for

farming. An estimated 50% of Israeli's agricultural land is irrigated<sup>22</sup>. Given the lack of natural water resources and dry climate, Israel is leveraging on the use of desalination plants, reuse of treated sewage for agriculture, computerised early warning systems for leaks and computerised drip irrigation and micro sprinklers. Israel ranks 20th among 113 countries on the global food security index due to the climate adaptation initiatives currently been implemented<sup>23</sup>.

### Netherlands

The Dutch Government has successfully built sustainable partnerships with the private sector and research institutes to tackle climate change challenges. The cooperation formed the building blocks for the Dutch Agriculture and Enterprise Policy.



A specific feature of the policy is the established linkage between adaptation and mitigation interventions for optimal results<sup>24</sup>. The government launched the Delta Programme focusing on three issues:

- Setting new water safety standards.
- Supplying fresh water for agriculture and natures.
- Planning and development of climate-proof and water-robust spatial

The Delta programme has significantly reduced flooding and increased the volume of water available for agricultural purposes<sup>25</sup>.

### Ethiopia

The existence of diverse agro-ecological conditions enables Ethiopia to grow a large variety of crops. The country is adopting a wholistic approach to mitigate and adapt to climate change vulnerabilities through the following climate-smart agricultural practices:



- **Conservation Agriculture:** This was implemented through reduced tillage and crop residue management to help reduce emissions from farm machinery and increase resilience to dry and hot spells. The conservation agriculture techniques including crop residue retention, minimum soil disturbance and intercropping (or rotation) of maize and legumes have been reported to improve both crop yields and soil health by increasing moisture levels and reducing soil degradation<sup>26</sup>. This approach has increased the productivity of over 21,000 farmers in Ethiopia<sup>27</sup>.
- **The Climate Resilient Green Economy Strategy (CRGE):** The CRGE Strategy was developed in 2011 based on four pillars, of which two are mainly focused on Climate Smart Agriculture including: 1) adoption of agricultural and land use efficiency measures and 2) increased greenhouse gas

sequestration in forestry, including protecting and re-establishing forests for their economic and ecosystem services, including carbon stocks<sup>28</sup>. Specifically, Ethiopia prioritised improved inputs and better residue management to reduce demand for additional agricultural land that would primarily be taken from forests<sup>29</sup>. CRGE is targeted at creating new agricultural land in degraded areas through small, medium, and large-scale irrigation to reduce the pressure on forests as agricultural production expands.

- **The Ethiopian Programme of Adaptation to Climate Change (EPACC):** The EPACC is targeted at building a climate-resilient economy through adaptation initiatives implemented at sectoral, regional and local community levels. EPACC calls for the mainstreaming of climate change into decision-making at a national level and emphasizes planning and implementation monitoring<sup>30</sup>. EPACC was designed to address issues around diseases and pest, low agricultural productivity that emanates from climate change through effective research and development.

### Ghana<sup>31</sup>

Ghana Climate Innovation Centre (GCIC) is funded by the Government of Denmark and the Netherlands through the World Bank. The Centre is focused on supporting the growth of sectors relevant to climate change through the provision of business advisory services, training, market development services, technical facilities, policy support and funding. GCIC is also pioneering a business incubator focused on developing SMEs and entrepreneurs in Ghana's Green Economy. GCIC leverages partnership with key industry players in five key sectors including energy efficiency, domestic waste management, water management and purification, solar energy and climate smart agriculture to promote climate smart initiatives.



As part of the centre's efforts to fund and support climate smart agriculture initiatives, GCIC partnered with Crop Research Institute- Savannah Agricultural Research Institute (CRI-SARI) in 2019 to support the adoption of the aeroponics technology for seed yam production under the **Yam Improvement for Income and Food Security in West Africa Project II (YIIFSWA II)**. CRI-SARI will use the funds to construct irrigation, greenhouse and storage facilities to cultivate foundation seed yam produced from the aeroponics system technology. This initiative will increase the availability of



high-quality seeds yam to for smallholder farmers.

In 2018, Neat Eco-Feeds established a 175 X 175 substrate tank capacity maggot farm in Bawku West District Ghana with a Proof of Concept Grant worth \$18,000 from GCIC. This intervention by Neat Eco-Feeds recycles waste from abattoirs to produce maggots which are processed and sold as feed for poultry and animal production. The production of feeds from maggots will reduce the global issues caused by deforestation and overfishing to produce fish meal.

African countries must device innovative initiatives and collaborate on major initiatives to curb the national and global impact of climate changes.



## SAHEL CONSULTING SPEAKS

### **NPA Annual Summit 2019, Lagos, Nigeria**

Ndidi Nwuneli, spoke on "Positioning for Post Oil Economy" at the NPA Annual Summit in Nigeria in January 2019.

### **Future Leaders Conference, Lagos, Nigeria**

Ndidi Nwuneli spoke on "Opportunities for Youths in Agribusiness" at Future Leaders Conference in February 2019.

### **FBN Quest Women Interactive Network, Lagos, Nigeria**

Ndidi Nwuneli spoke on "Balance for Better" at FBN Quest Women Interactive Network in March 2019.

### **Africa Climate Week, Accra, Ghana**

Ndidi Nwuneli spoke on "The Impact of Climate Change on Agriculture" at the Food and Land Use Coalition conference during the Africa Climate Week Accra in March 2019.

### **Aluko & Oyebo's International Women's Day Celebration, Lagos, Nigeria**

Ndidi Nwuneli served as a speaker at the Aluko & Oyebo's International Women's Day Celebration in March 2019.

### **Climate Smart Agriculture Validation Workshop, Adamawa, Nigeria**

Falaq Tidjani spoke on the "entry point for investing in climate smart agriculture at scale in north-east Nigeria" at the workshop convened by Climate Change Agriculture and Food Security (CCAFS) in Adamawa in March 2019.

### **The Platform Lagos, Nigeria**

Ndidi Nwuneli spoke at the Platform Nigeria on the "Drivers, Enablers and Obstacles to Growth – Food & Agriculture" in May 2019.

### **Seeds and Chips, Milan, Italy**

Ndidi Nwuneli spoke on two panels and moderated one panel discussion on various topics including: "relationship innovation, policy, and investment" and the "African Food Revolution," at Seeds and Chips in Milan, Italy in May 2019.

### **Lagos Business School, Nigeria**

Ndidi Nwuneli gave a lecture at the Lagos Business School on the "Opportunities in Agribusiness in Nigeria" in May 2019.

### **International Livestock Research Institute Design Workshop, Ethiopia**

Nathalie Ebo participated in the International Livestock Research Institute (ILRI)'s Design Workshop - Portfolio of investments focused on Livestock Innovations for Sustainable & Inclusive Transformation of food systems in March 2019 in Addis Abeba, Ethiopia.

### **YIIFSWA II Adapted Yam Miniset Technique (AYMT) Training**

The YIIFSWA II project team supported farmers AYMT training in the Volta Region, Ghana in April 2019.

### **National Livestock Transformation Plan, Nigeria**

Nathalie Ebo attended the National Livestock Transformation Plan (NLTP) Coordination Meeting in May 2019.

### **Innovative Approaches to Evidence Uptake in Africa, Kenya**

Temi Adegoroye participated at the convening on Innovative Approaches to Evidence Uptake in Africa organized by the Partnership for African Social and Governance Research (PASGR) in Nairobi, Kenya in May 2019.

### **NDDP Study Trip in India**

The Nigerian Dairy Development Program team undertook a 7-day study trip to India to learn about the local dairy systems in May 2019.

## SAHEL CAPITAL SPEAKS

### **Private Equity and Venture Capital Association (PEVCA), Nigeria**

Mezuo Nwuneli moderated a panel on "Private Equity in Africa" at the Private Equity and Venture Capital Association (PEVCA), Nigeria, Breakfast Forum hosted at Radisson Blu, Victoria Island, Lagos on November 30, 2018.

### **10th Annual Retreat of the Central Bank of Nigeria's Bankers' Committee, Lagos, Nigeria**

Mezuo Nwuneli spoke on a panel discussing Financing Export and Trade Development at Radisson Blu, Ikeja, Lagos on December 9, 2018.

### **Agribusiness Private Investments in Africa, Paris—France**

Mezuo Nwuneli spoke on a panel at the "Agribusiness Private Investments in Africa" workshop in Paris. It was hosted by MEDEF International, the African Development Bank, and the African Agricultural Council on March 20, 2019.

### **FATE Foundation, Lagos, Nigeria**

Olumide Lawson was a Faculty Member for Fate Foundation Scale-Up Lab Agribusiness Accelerator Programme April 23, 2019

### **UK-West Africa Agritech Mission, Lagos, Nigeria**

Mezuo Nwuneli spoke on the "Financing Agribusiness Invest Africa" panel during the summit on May 21, 2019.

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