

# Climate-Smart Agriculture in Yobe state of Nigeria

## Climate-smart agriculture (CSA) considerations

**A P** Agriculture is the mainstay for Yobe state economy employing over 80 percent of the population. Agricultural practices in the state are mainly rain-fed with majority of the farmers engaged in small scale subsistence farming with millet, sorghum, cowpea and maize as major food crops and gum arabic, groundnut, sesame seed and cotton as cash crops. A significant proportion of the population are pastoralists rearing livestock such as cattle, sheep, goats, donkeys and horses at commercial level.

**A P** The agricultural sector in the state is struggling to meet the increasing food demand for its growing population as it battles with low productivity arising limited investments, low farm input use, land tenure and climate variability. In addition, the problem of flash floods, high temperature and incidences of pests and diseases have also aggravated the irrigation and upland farmers' losses which consequently increase the incidence of poverty and malnutrition in the state.

**A P** CSA practices and technologies such as the use of micro dosing, improved seed varieties, intercropping, planting pits, integrated soil fertility management, fodder banks etc. are quite widespread and their proliferation has been facilitated by ease of adoption, and multiple benefits such as food, income diversification and improved resilience.

**I A** Although there are a wide range of organizations conducting CSA-related work, most have focused largely on food security, environmental management and

**P M** adaptation. There is the need to also integrate mitigation into the state's climate-smart agriculture development efforts. In addition, off-farm services related to CSA need to be enhanced, including weather-smart and market-smart services.

**I** The Yobe state government places high priority on the development of the agricultural sector in the state. The state ministry of agriculture is saddled with the responsibility of implementing agricultural policies that enables CSA. The broad strategic goals include creating an operating environment that supports rapid modernization of agricultural production, processing, storage and distribution through supportive government policies.

**\$** Funding for CSA is limited in the state and Nigeria in general, however there are opportunities to access and utilize international climate finance from sources such as the Green Climate Fund and Global Environment Facility and through readiness and capacity building programmes. At the national level, the National Agricultural Resilience in Nigeria, an arm of the Federal Ministry of Agriculture and Rural Development which targets reforestation, agriculture and livestock, is a useful mechanism for directing climate finance to CSA-related activities. Others are the fund set aside for the National Climate Change Adaptation Strategy and Action Plan for Climate Change in Nigeria (NASPA-CCN) which can benefit CSA-related activities the Yobe state.

**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 tradeoffs 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 Yobe state 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.

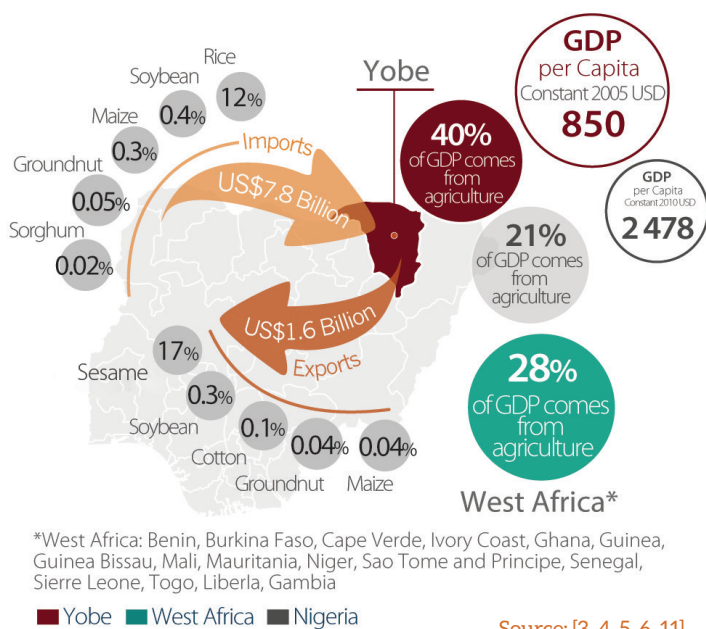
## State context

### Economic relevance of agriculture

The agricultural sector is the mainstay of the economy of Yobe state and contributes about 40 percent to the state's gross domestic product (GDP) with crop production and livestock as the major drivers [3, 4]. Yobe state's economy is relatively small with more than 80 percent of the citizens engaged in small-scale subsistence farming. Millet, sorghum, cowpea and maize are the major food crops. The cash crops that are commonly grown in the state include groundnut, gum arabic, sesame seed and cotton. Although exportations figures are not currently available at state level, major agricultural export crops contributing to the national economy are sesame, soybean, cotton, groundnut, and maize.

The top five agricultural products imported into Nigeria and for that matter the state are, rice, soybean, maize, groundnut and sorghum [5].

### Economic relevance of agriculture in Yobe



Yobe state has an estimated population of 3.4 million people with about 60 percent living in rural areas. About 80 percent of the population are engaged in primary production agriculture [6]. Majority of the population live below the national poverty line with rural populations constituting 76 percent. Recent data showed unemployment rate of 26.2 percent (2011) and income inequality index of 0.38 [7]. With regards to education, adult and youth literacy stands at 52 percent (2008) and 40 percent (2008) respectively [4, 7, 8]. Most of the rural population (about 66 percent) have limited access to portable water. Development agencies through the Water, Sanitation and Hygiene (WASH) [9] funded projects are increasing efforts to improve access of the population to clean portable especially for about 1.4 million of the population thought to have been displaced following the Boko Haram insurgency in 2013 [10].

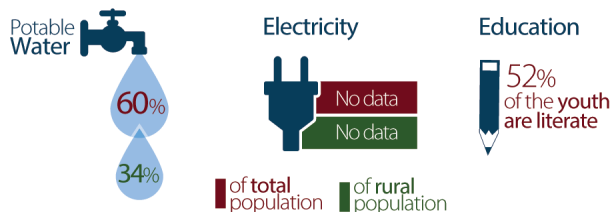
## People, agriculture and livelihoods in Yobe

### Demographics

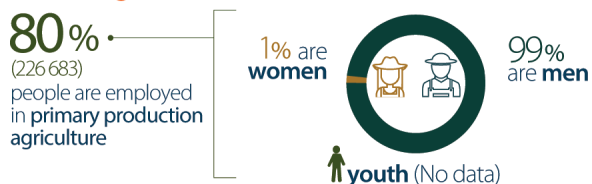
3.4 million people live in Yobe



### Access to basic needs



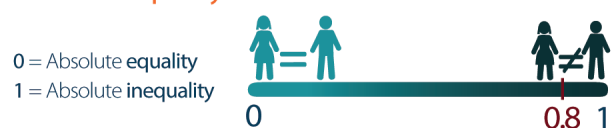
### Jobs in agriculture



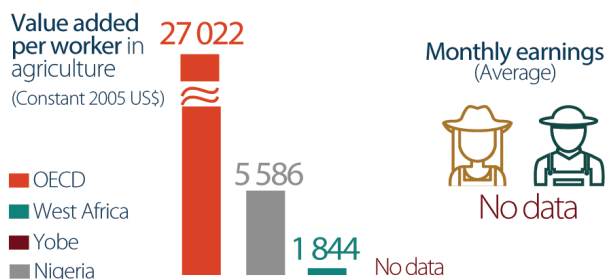
### People living below



### Gender inequality (Index)



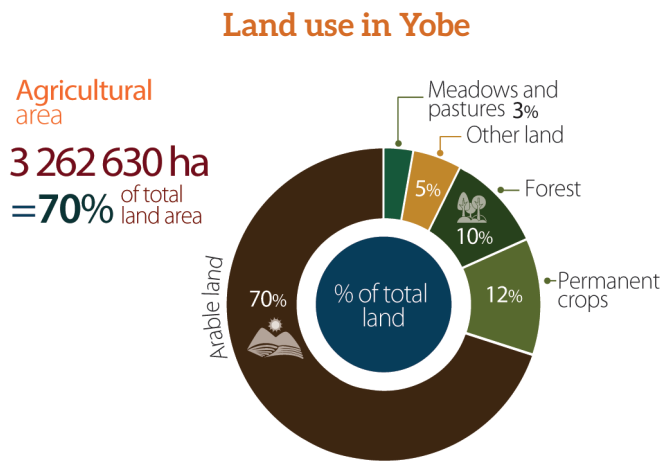
### Agriculture productivity and incomes



Source: [4, 7, 8, 9, 10, 11]

## Land use

Yobe state has a total land area of 47 153 square kilometer of which 70 percent of the land area (33 007.1 square kilometer) is classified as arable land, 10 percent forest, 11.9 percent under permanent crop production and 3.15 as permanent meadows. The vegetation is mostly light foliage and thorns [4, 12]. Grasses are short, discontinuous, wiry and tussock. They are much used by cattle and sheep. There is no real gallery or fringing forests but only riparian woodland of certain acacias, tamarind and baobab. The basic agriculture of the savannahs is upland rainfed cultivation with crops such as maize, sorghum, cowpea, groundnut, rice, and recently soybean [13]. In most areas, the cereal cropping systems are being intensified and new crops are replacing the old ones.



Source: [4, 12, 13]

## Agricultural production systems

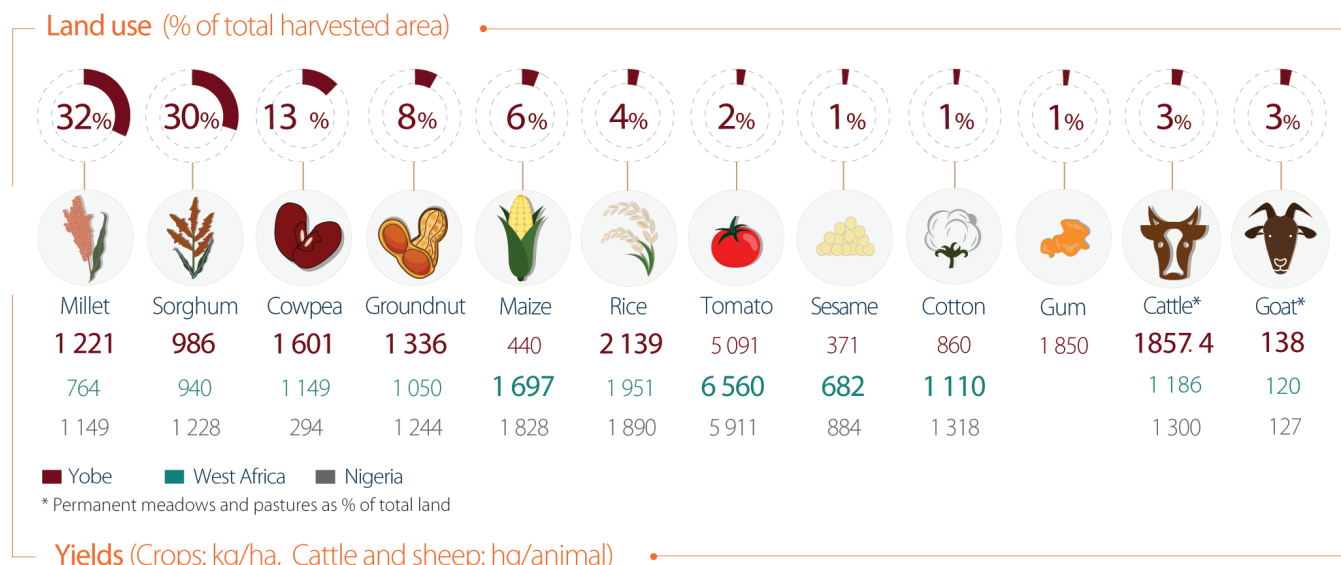
Yobe state is located in the sudano-Sahelian vegetation zone which is characterized by a hot and dry climate for most of the year [14] (annex 1). The region is both semi-arid and arid with low rainfall amounts of about 300 mm per year [14]. The state is divided into two agro ecological zones which include the sahel savannah located in the northern part covering Gujba, Yusufari, Bursari, Tarmuwa, Machina, Karasuwa and Bade local government areas of the state, while the sudan savannah in the southern part of the state covers Jakusko, Nangere, Nguru, Potiskum, Fika, Gujba, Yunusari, Fune, Gulani and Damaturu local government areas. It has an annual precipitation of between 500 and 600 mm. The sahel savannah zone is suitable for the cultivation of millet, maize, sorghum, rice, wheat, beni seed, gum arabic, groundnut, bambara nut, guna seed, egyptian doum palm, cassava, mango, onion, tomato, kenaf and sorrel [3]. The sudan savannah zone of the state is conducive for the cultivation of wide varieties of cereal crops (millet, maize, sorghum, rice, wheat), fruits and vegetables (mango, guava, tamarind, egyptian doum palm, tomato, pepper, kenaf, sorrel, onion), cassava and cotton [3].

[15] reported that, the average yield for maize, sorghum, cowpea, rice and groundnut in 2015 were 441 kg/ha, 985.7 kg/ha, 1 602 kg/ha, 1 221 kg/ha, and 1 337 kg/ha, respectively. These yield values were significantly lower than the standard expected yield for the respective crops. According to FEWSNET, the below-average 2015 harvest in the entire northeast was attributed to the prolonged conflict (for the third consecutive year) which severely restricted cropping activities. The low yields could also be attributed to climate variability particularly the delayed onset of rains and the increasing length and frequency of dry spells during the growing season. In addition, the problem of flood, high temperature and incidences of pests and diseases have also aggravated the irrigation and upland farmers' losses which consequently increase the incidence of poverty and malnutrition in the state [16].

Livestock production in Yobe state also plays an important role in the livelihoods of the agro-pastoral farmers. About 60 percent of households are engaged in livestock production due to the pastoral nature of the dominant communities in the state. Cattle, goat, sheep and poultry are some of the different types of livestock kept by households in Yobe state [15].

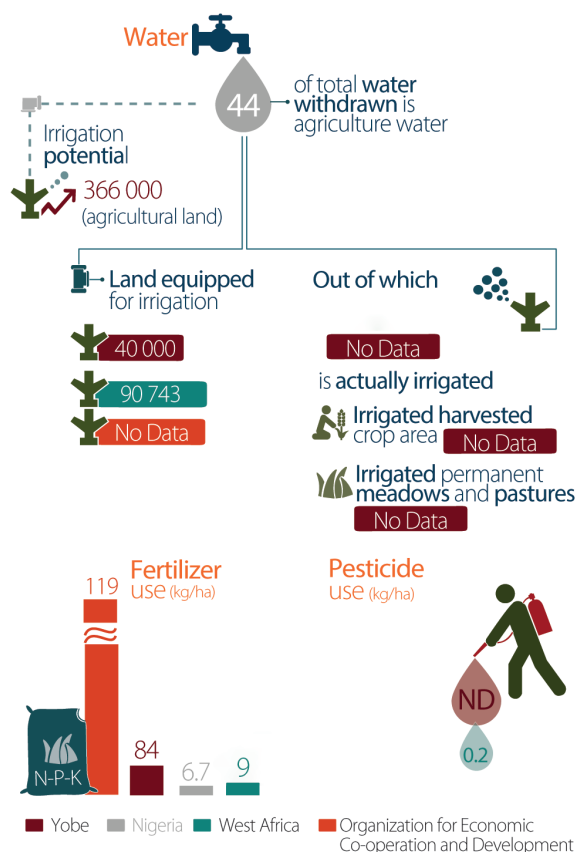
The following infographic shows a selection of agricultural production systems considered key for food security in the Yobe state of Nigeria. The selection is based on the production system's contribution to economic, productivity and nutrition quality indicators. For more information on the methodology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

## Production systems key for food security in Yobe



Source: [5, 17]

## Agriculture input use in Yobe



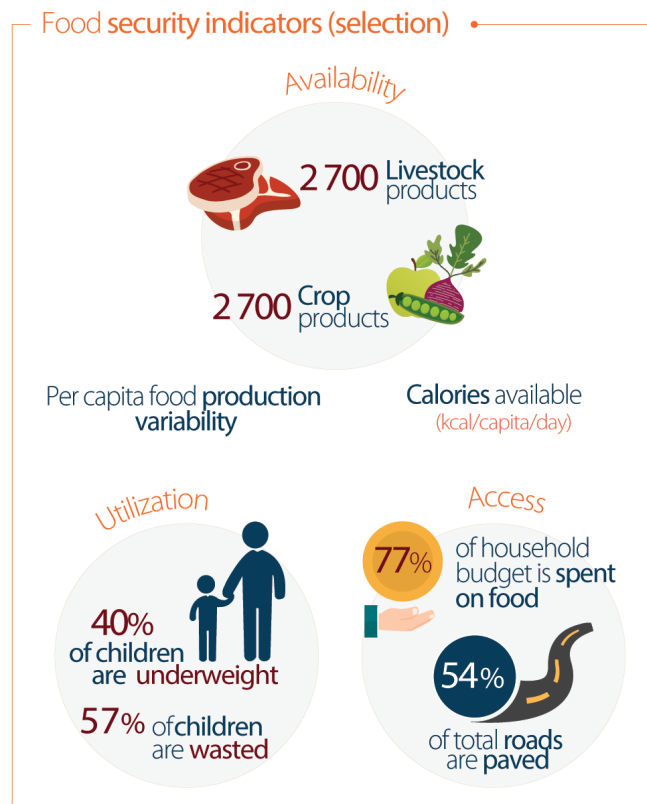
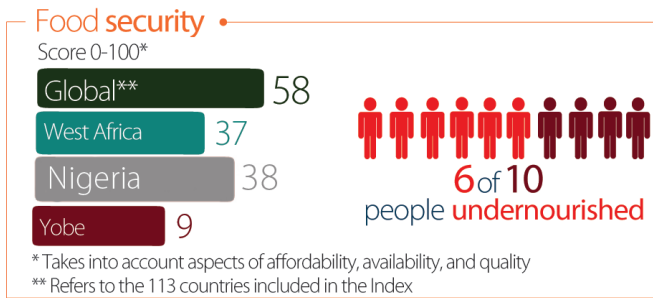
Source: [5, 17, 21, 22]

## Food security and nutrition

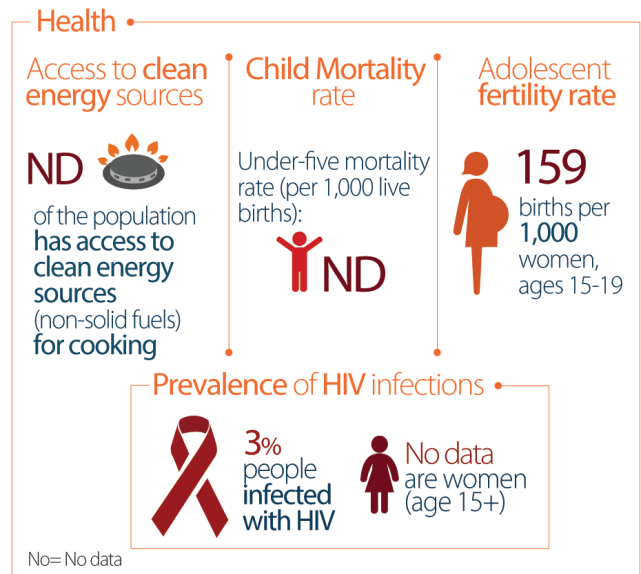
The World Food Programme (WFP) in 2017 reported that, 8.8 percent of households in Yobe State are food secure, 54.8 percent are marginally food secure, 30.5 percent are moderately food insecure and 5.9 percent are considered as food insecure [18]. The causes of insecurity in the state can be attributed to lack of funds needed by the farmer to purchase the required agricultural inputs due to difficulties in accessing credit facilities, problem of the Boko Haram insurgency which restricted access to agricultural land and labour, climate change and natural disasters, lack of functional irrigation schemes, low technology for processing and storage as well as poor information dissemination on agricultural practices that are climate smart [18].

Yobe state has the highest number of malnutrition cases in Nigeria. The World Food Programme in 2017 revealed that the global acute malnutrition is 11.4 percent in Yobe state compared to 11.3 percent and 5.6 percent in Borno and Adamawa states respectively. The prevalence of underweight children below the age of 5 years in the state is 39.6 percent and 57.2 percent were estimated to be stunted [19]. The fertility rate and the percentage of literate population in the state are 15.90 percent and 7.23 percent respectively [7]. The prevalence of HIV rate for the population in Yobe state is 3 percent [20].

## Food security, nutrition, and health in Yobe



Source: [7, 19, 24, 25]



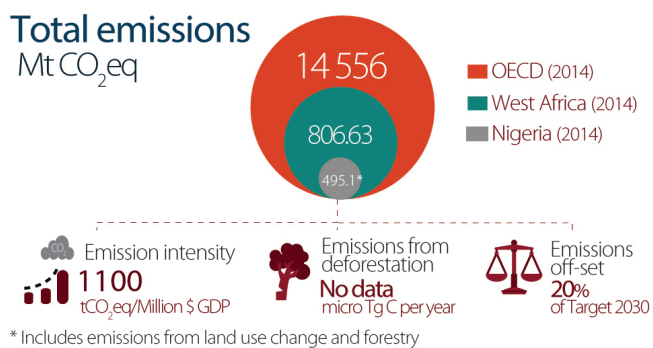
Source: [8, 23]

## Agricultural greenhouse gas emissions

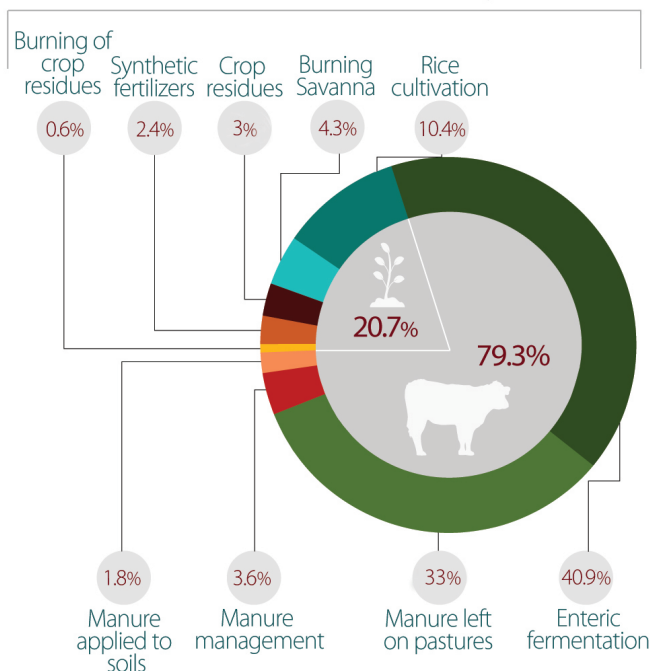
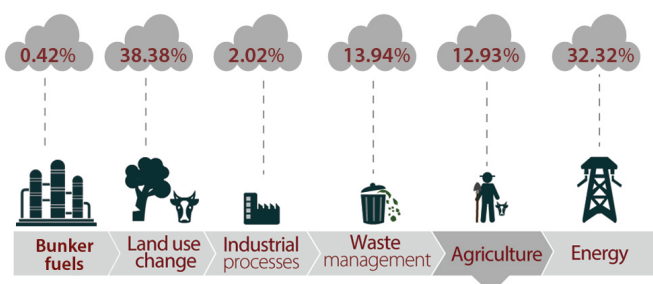
Like most parts of north-East Nigeria, around 14 percent of human-generated greenhouse gases are estimated to come directly from agriculture in Yobe state; for example, almost half of all methane and nearly 60 percent of nitrous oxide emissions are generated by agricultural activities, including livestock production, and fertilizer and pesticide applications. A further 18 percent of greenhouse gases come from land use changes (e.g. clearance of forests for crops and pasture), soil erosion or machine intensive farming methods, which also contribute to increased carbon dioxide concentrations in the atmosphere. Reducing agriculture's carbon footprint is therefore an important consideration to limiting climate change [26].



## Greenhouse gas emissions in Nigeria



### Sectoral emissions (2014)



Source: [5, 28, 29]

## Challenges for the agricultural sector

### (a) Growth in population and food demand

Agriculture is the principal source of food and livelihood in Yobe, making it a critical component of programs that seek to reduce poverty and attain food security. To meet the rapidly increasing demand for food by an ever-expanding human population, production from crop agriculture must expand by 4 percent annually while the production of food from animal agriculture must expand by more than 3 percent annually, between now and the year 2050. This will result in great pressure on land, leading to intensification of land use. Under these conditions, full integration of crop and livestock production offers the greatest potential for increasing agricultural productivity [27].

### (b) Natural resource scarcity/depletion

Drought and soil fertility depletion are common phenomena in Yobe and regarded as the fundamental biophysical cause for declining per capita food production. This challenge will continue as population pressure increases and degradation of soil resources is aggravated. Overgrazing, constant bush burning, extensive tree felling for timber, fuel wood and continuous land cultivation have contributed negatively to soil fertility. Soil degradation due to inappropriate land use system is threatening the livelihood of thousands of people. Presently, large areas of land in Yobe State have been abandoned due to soil fertility depletion as the result of continuous cultivation. In order to make sound decisions regarding land use, knowledge of specific properties related to soil functioning under different land use systems are necessary [27].

### (c) Poverty and inequality

Majority of the Yobe population lives in poverty, despite the wealth in Nigeria. Nigeria's inequality level was 0.45 in 2010 which is relatively high and indicates that income is held in the hands of relatively few. In the northeast where Yobe state belongs, the poverty rate is 69.1 percent. With increased poverty, a large proportion of farmers are resource-poor to meet the agricultural input requirements on their farmlands. This poses threats to food production and challenges efforts to improve food and nutritional security in the Yobe state [27].

### (d) Poor Infrastructure and limited financing schemes

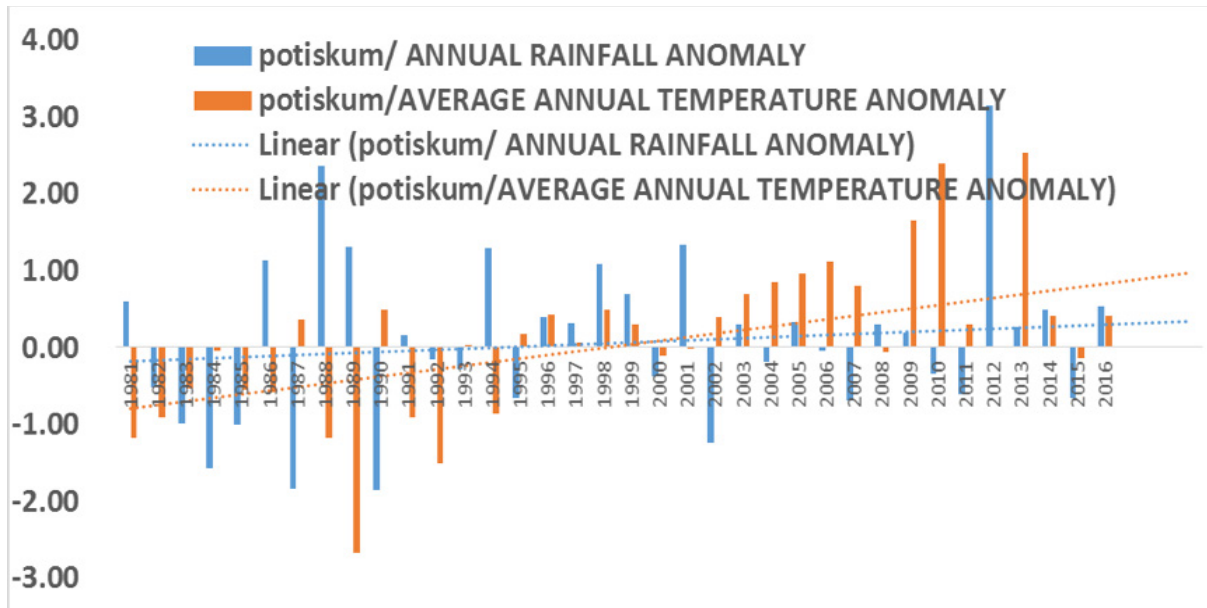
Agricultural performance in the Yobe state is greatly impaired by the low level of development of social infrastructure. In the rural areas, where majority of the smallholders operate, inadequate infrastructure constitutes a major constraint to agricultural investment, production and trade. In addition, many farmers and value chain operators have no access to formal credit to finance their operations. With the scarcity and rising cost of farm inputs and processing, it is difficult for value chain actors to engage in commercial agriculture projects especially in view of their low level of income and savings, and access to credit challenges [27].

# Agriculture and climate change

In Yobe state, analysis of climatic data over 35 years (1981- 2016) have shown anomalies in rainfall, temperature and evaporation within Yobe state represented by Potiskum in the south (sudan savanna) and Nguru (sahel) in the north. During these period, Yobe state and indeed the entire northern part of Nigeria suffered series of drought notably, the droughts of 1970s, 1980s and 1990s that can be seen in Figures 1-2. There is an observed increasing average rainfall trends but this was accompanied by higher average temperature trends (1999–2016) for Potiskum.

This higher temperature trend will have effect on crop and pasture production [30].

The impacts of the changes also results in the loss of crops due to drought and bush fires. Other challenges related to climate change in the state include: the uncontrolled deforestation, land degradation and insecurity all leading to, declining agricultural yields. Climate change will impact negatively on the food security and livelihoods of farmers.



Temperature Trend = 0.46 °C per decade      Rainfall Trend = 1.35 mm per year

Figure 1: Rainfall and temperature trends in Potiskum, Yobe state (1981-2016)

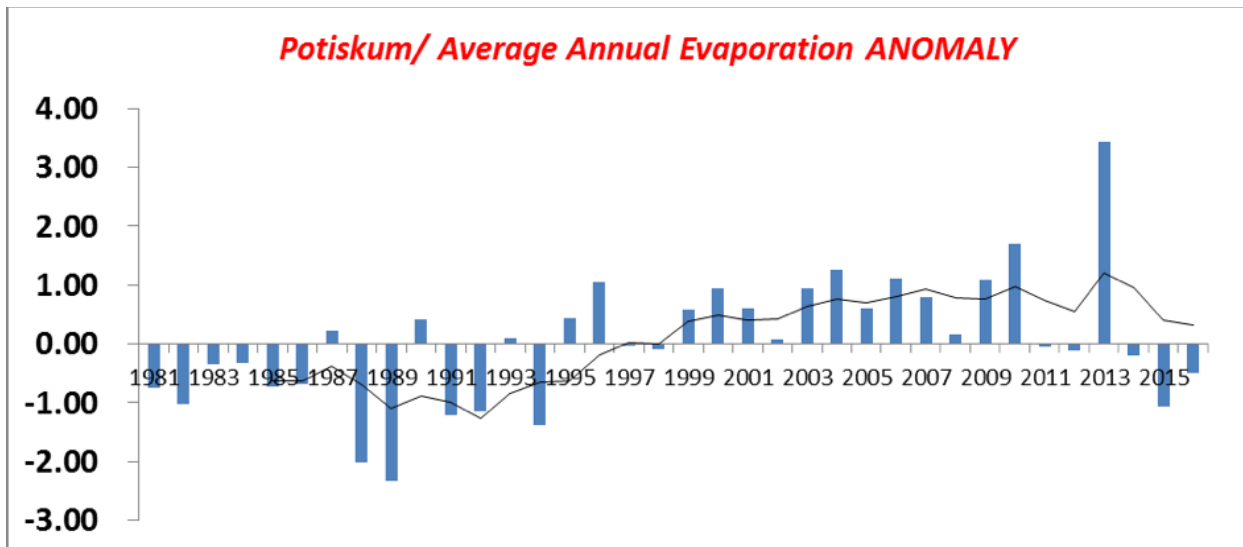


Figure 2: Average evapotranspiration anomaly in Potiskum, Yobe state [30].

## 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. Evidence from the literature suggests that farmers are using several agricultural innovations developed from indigenous knowledge or introduced technologies to improve their adaptive capacity to climate change and variability. Some of these practices are *ex ante*, meaning they are based on pre-informed climatic events while others are *ex post* (measures adopted after a climatic event has been realised). Below, we used evidence from the literature to discuss some agricultural technologies and practices in the Yobe state have been promising in achieving one or more of the three pillars of CSA: productivity, mitigation and adaptation:

**a. Micro-dosing** – micro dosing was introduced to Yobe state by the International Fund for Agricultural Development (IFAD) in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). The practice is used at the planting stage and after thinning for cereal crops (millet, sorghum, wheat and maize). At planting, a coca cola cap of fertilizer is planted with the seeds on a soil that has adequate moisture content. After planting and thinning, the second dosage of fertilizer is applied at the rate of 2 coca cola cap filled with fertilizer at a depth of 5 to 8 cm. The practice has the advantages of reducing the amount of fertilizer usage and wastage of fertilizer compared to the broadcasting method of fertilizer application. The practice resulted in higher yield of 2 000 kg/ha compared to the control which gave a yield of 1 200 kg/ha. The practice is widely used with adoption rate of up to 80 percent in areas with awareness on the benefit of the practice. The barrier to the adoption of micro dosing as a CSA practice is that, it is labour intensive.

**b. Conservation agriculture** - like most farming communities in Nigeria, conservation agriculture (CA) is a common practice in the Yobe State with soil and water conservation attributes. Building on conventional slash-and-burn agricultural systems, CA approaches involve: (a) minimum or zero-tillage; (b) maintenance of soil cover through cover cropping or mulching; and (c) crop rotation [31]. CA delivers on one or more of the three pillars of climate-smart agriculture. The use of CA is driven by increased soil degradation throughout the dry areas of north-east Nigeria where crop yields are relatively low due to low soil organic matter, limited use of fertilizer inputs and recurrent droughts. In terms of productivity and adaptation, empirical evidence confirm CA increase the biological yield of major food crops such as maize, sorghum and millet even on poor soils and offer economic benefits from diversified crop rotation systems [31]. Maintaining adequate soil cover through mulching offer multiple benefits to the farmer in dealing with climate-related risks.

These include reduced run-off, increased water infiltration, improved soil organic matter and improved soil moisture retention. The encouragement of zero or minimum tillage in CA also minimizes labour costs in land preparation and enables early planting to synchronize the onset of rainfall.

**c. Intercropping/crop diversification** - with crop diversification and use of varying intercropping approaches in CA, there is significant reduction in the risks of crop failure providing farmers important safety nets in the event one crop fails to perform as expected. Cereals (maize and millet) and legumes (cowpea and groundnut) are often grown in annual double-cropping systems in the sudan and guinea savanna zones. Typical double cropping systems in these zones include maize-cowpea, millet-maize, millet-cowpea and groundnut-maize. Intercropping is widely practiced in different parts of the state, particularly in the sudan savannah. Cereals are often intercropped with legumes or with other cereals for economic reason.

**d. Planting pits (Zai)** – in the sahel areas of Yobe, farmers use planting pits call zai as water harvesting techniques to retain water for sorghum and millet production [32, 33]. Developed from indigenous knowledge, the techniques are being promoted as climate-smart soil and water conservation technologies [34, 35]. Zai involves digging pits (at 20-40 cm diameter and 10-15 cm depth) to accumulate water before subsequent planting with or without the application of organic resources such as compost, plant residues and animal manure [33]. Farmers use the techniques mainly on bush fields, on dry eroded valley soils as well as on normal and degraded bare lands to maintain soil moisture, reduce soil erosion, and improve soil fertility [36]. Zai remains common among many smallholder farming communities in the Sahel despite their strenuous manual labour requirements per hectare (about 300 man/h) during the dry season; unpredictable rainfall patterns and high temperatures. Crops such as sorghum, millet and cowpeas are successfully planted with these techniques by employing other conservation agriculture techniques such as the application of animal manure or compost [37].

**e. Erosion control techniques** - although rainfall is important for farming activities, excess rains cause flooding and erosion on farmers' fields causing crop destruction and removal of top soils [38]. The use of innovative approaches such as contour/tie ridges for reducing erosion and collecting run-off water for farming activities are becoming popular among farmers in Yobe.

**f. Improved seeds** - over the past decades with increased temperatures and higher intensity of rain, many farmers have adopted the use of varieties that are resistant to extreme weather conditions. Some adopted seeds are also early maturing to evade consequences of reduction in amount of rainfall being experienced under varying and changing climate.

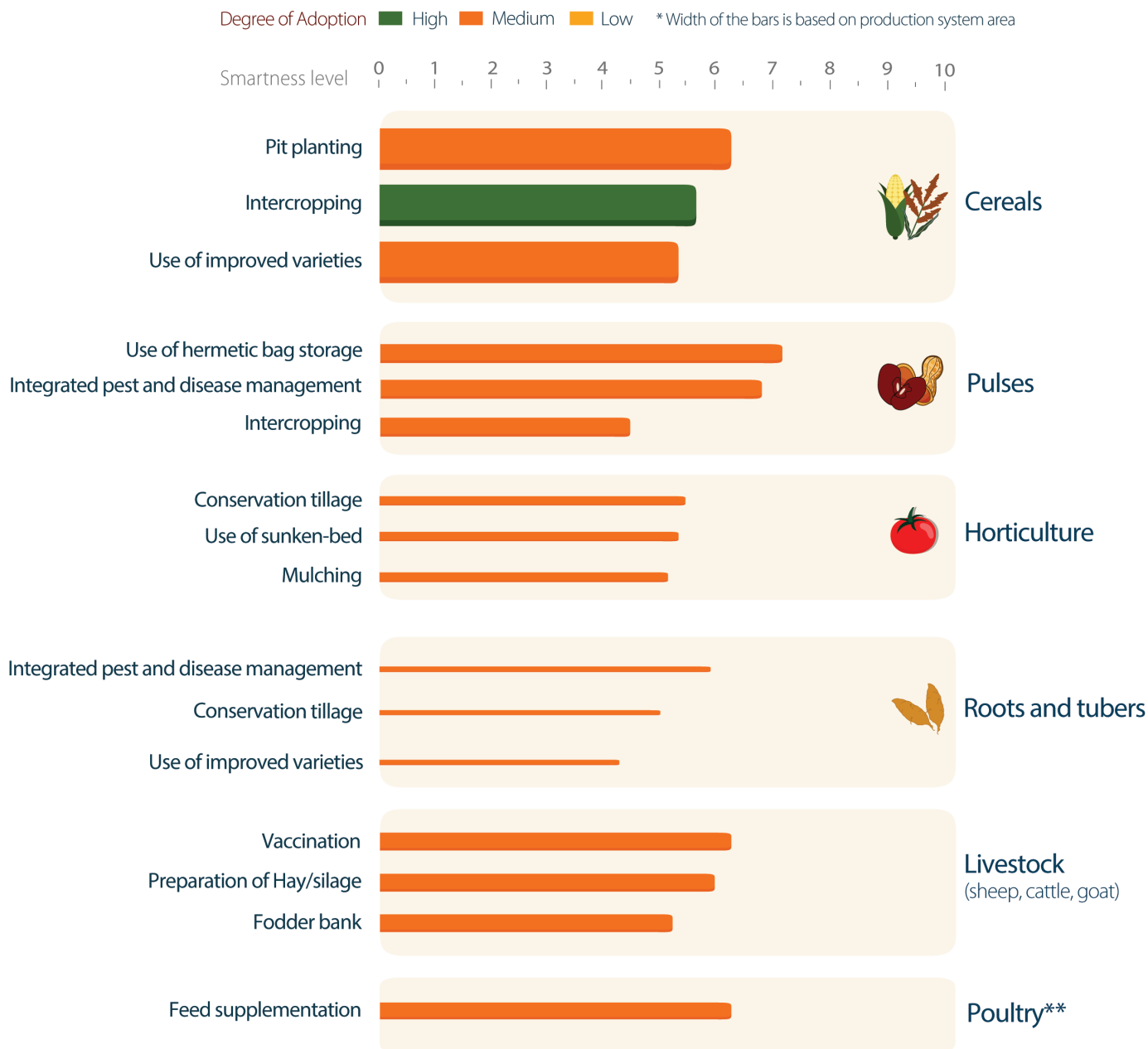


**g. Integrated soil fertility management** – farmers combine chemical fertilizers with other soil fertility improvement practices such as application of animal manure, compost, crop residues etc. Addition of organic manures to improve soil aggregate stability necessary and improve soil nourishment through decomposition and nitrogen mineralization. Using integrated soil fertility management practices markedly reduce the need of large quantities of synthetic fertilizers which, apart from their high costs contribute to GHG emissions.

**h. In livestock production** – common CSA practices for cattle, sheep and goats identified are seasonal migration, especially during dry period in search of pasture and water for pastoralists, improved housing for sedentary herders to create microclimate to shield the animals from excessive heat and rainfall and provision of quality water that helps in production. Others are conservation of feed for off season utilization and improved medication. In addition, for poultry production routine vaccination and feed formulation with locally available materials to reduce cost are common practices.

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/ zero impact on a selected CSA indicator, with 10 (+/-) indicating a 100 percent 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 and a more comprehensive list of practices analyzed for Yobe State, Nigeria can be found in Annexes 3 and 4 respectively.

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



\*\* Unidentified production system area

## Case study: Improved variety of millet intercropped with cowpea as a climate-smart option for farmers in Yobe state – field evidence



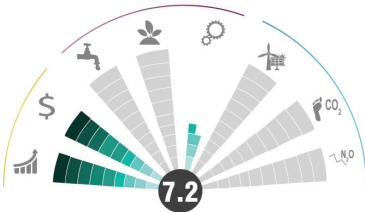
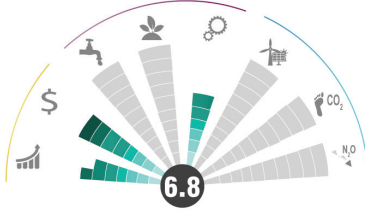
Pearl millet is one of the staple cereals crops grown in Yobe state. It is largely grown in the drier ecological zone of the state that has rainfall of just about 300-400 mm during the 3-month rainy season. It is a hardy crop that tolerates drought better than any other cereal grown in Nigeria. Farmers in Yobe state grow several varieties of the crop with varying yield potentials.

For many years, Ali Shehu, like many farmers in his location of Potiskum local government area of Yobe state, was growing the local traditional millet variety, Gwagwa until when he was introduced to an improved variety known as SOSAT in 2012. Typical of local farmers, Ali Shehu did not accept the improved cultivar as a total replacement of his traditional variety, rather he decided to grow the two pearl millet varieties alongside each other on the same farm for comparison and preservation of his traditional variety. So for four years Ali grew the traditional Gwagwa on one half of the one hectare farm and SOSAT on the other half. The millet was intercropped with sorghum and cowpea as practiced by most farmers around Potiskum area. The crop geometry consisted of two rows of millet, one row of sorghum and cowpea was planted on millet rows (in between millet stands). This is the common practice by farmers around Potiskum locality.

With good management, the mean yield of the local Gwagwa millet variety in three cropping seasons was 550 kg/ha. On the other hand the mean yield realized by Ali for the improved SOSAT millet cultivar was 900 kg/ha giving a yield difference of 350 kg/ha over the traditional variety. In 2017 and 2018 cropping seasons, Ali planted both the local and the improved millets on the same farm in a design of 10 rows of local millet and 10 rows SOSAT millet. This time around, the millets were intercropped with cowpea only, sorghum was not included. At the end of the seasons the average yield of local variety was 400 kg/ha while that of SOSAT was 750 kg/ha giving a difference of 350 kg/ha. The above production clearly shows that the improved variety of millet (SOSAT) grown under the same farmers' practice of intercropping with sorghum and cowpea gave Ali Shehu yield increases of 64 percent over the use of the traditional local variety. When the intercropping was limited to cowpea by excluding sorghum, the yield advantage increases to 88 percent. This is a clear demonstration of how climate-smart options like the use of improved cereal intercropped with legumes such as cowpea could help boost crop productivity and diversification which can also potentially increase income of farmers.



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

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</b> (72 percent of total harvested area)				
Pit planting	Sudan savanna 30-60%	M		<p><b>Productivity</b> Enhances production per unit area.</p> <p><b>Adaptation</b> Improves and conserve soil fertility; improves adaptation to drought.</p> <p><b>Mitigation</b> Reduces GHG emissions (carbon footprint) by reducing consumption of energy, synthetic fertilizers and other agricultural inputs.</p>
Intercropping	Sudan savanna 60%	M		<p><b>Productivity</b> Enhances production per unit area; Diversifies food sources.</p> <p><b>Adaptation</b> Provides important safety net to safeguard against climate-related risks; improves the prospects for income diversification.</p> <p><b>Mitigation</b> Reduces GHG emissions (carbon footprint) by reducing consumption of energy, synthetic fertilizers and other agricultural inputs.</p>
<b>Pulses</b> (22 percent of total harvested area)				
Use of hermetic bag storage	Sudan savanna 30-60%	M		<p><b>Productivity</b> Improves grain quality and minimizes post-harvest losses; improves income.</p> <p><b>Adaptation</b> Prevents diseases associated with crops; increases the potential to overcome climate shocks.</p> <p><b>Mitigation</b> Has no use of synthetic fertilizers and pesticides hence has no related GHG emissions/carbon footprint.</p>
Integrated pest and disease management	Sudan savanna 30-60%	M		<p><b>Productivity</b> Improves crop production and quality, hence potential increases in income.</p> <p><b>Adaptation</b> Prevents crop losses caused by diseases. Increases the potential to overcome climate shocks.</p> <p><b>Mitigation</b> Has no use of synthetic fertilizers and related GHG emissions/carbon footprint.</p>



Yield

Income

Water

Soil

Risk/Information

Energy

CO<sub>2</sub> Carbon

N<sub>2</sub>O Nutrient



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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**Roots and tubers** (0.2 percent of total harvested area)

Integrated pest and disease management

Sudan savanna  
30-60%



**Productivity**

Improves crop production and quality, hence potential increases in income.

**Adaptation**

Prevents crop losses caused by diseases. Increases the potential to overcome climate shocks.

**Mitigation**

Has no use of synthetic fertilizers and related GHG emissions/carbon footprint.

Conservation tillage

Sudan savanna  
30-60%



**Productivity**

Enhances production per unit area; Diversifies income and food sources.

**Adaptation**

Improves and conserve soil fertility; minimizes soil erosion.

**Mitigation**

Maintains or improves above and below-ground carbon stocks and soil organic matter content; reduces soil disturbance.

**Horticulture** (2 percent of total harvested area)

Use of sunken-bed

Sudan savanna  
30-60%



**Productivity**

Enhances production per unit area.

**Adaptation**

Improves soil moisture retention; minimizes erosion; improves water availability and utilization efficiency for increased resilience to drought.

**Mitigation**

A reduction in energy required for irrigation can reduce emissions intensity per unit of output..

Conservation tillage

Sudan savanna  
30-60%



**Productivity**

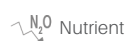
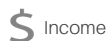
Enhances production per unit area; Diversifies income and food sources.

**Adaptation**

Improves and conserve soil fertility and improves yield; minimizes soil erosion.

**Mitigation**

Maintains or improves above and below-ground carbon stocks and soil organic matter content; reduces soil disturbance.



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

**Livestock** (3 percent)

Preparation of Hay/silage

Sudan savanna  
30-60%



**Productivity**

Improves overall productivity and increases income.

**Adaptation**

Provides alternative food source increasing adaptive capacity during periods of feed scarcity.

**Mitigation**

Reduces GHG emissions (carbon footprint) by reducing consumption of energy.

Vaccination

Sudan savanna  
30-60%



**Productivity**

Improves livestock production and quality, hence potential increases in income.

**Adaptation**

Prevents diseases associated with livestock. Increases the potential to overcome climate shocks.

**Mitigation**

Has no use of synthetic fertilizers and related GHG emissions/carbon footprint.

**Chicken** (NA)

Feed supplementation

Sudan savanna  
30-60%



**Productivity**

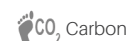
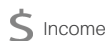
Improves overall productivity and increases income.

**Adaptation**

Provides alternative food source increasing adaptive capacity during periods of feed scarcity.

**Mitigation**

Reduces GHG emissions (carbon footprint) by reducing consumption of energy.



## Institutions and policies for CSA

The Yobe state government placed high priority on the development of the agricultural sector in the state. The state ministry of agriculture is saddled with the responsibility of implementing the agricultural policies of the state government. The broad strategic goals include creating an operating environment that supports rapid modernization of agricultural production, processing, storage and distribution through supportive government policies. This aimed at making agriculture more responsive to the demands of other sectors of the state and national economies. The policy framework is structured to create more agricultural and rural employment opportunities and increase the income of farmers through the infusion of improved technologies and support infrastructure. There are no known policies on CSA in the Yobe state of Nigeria. However, the development and promotion of CSA can be envisioned in Federal and national level policies on agricultural development and food. The government's long-term economic blueprint is expressed in the Nigerian vision 20: 2020 (2009), which aims to transform agriculture into a sustainable and profitable sector with a focus on increasing agricultural productivity and production for direct consumption and processing for local market and export. To implement Vision 20: 2020, the National Planning Commission developed a new medium-term plan for the period 2010-2013; meanwhile the Federal Ministry of Agriculture and Rural Development developed the National Agricultural Sector Strategy (NASS) and a five-point agricultural agenda, which is largely consistent with the four Comprehensive African Agricultural Development Plan (CAADP) pillars: water management, rural infrastructure, increasing food supply and technology transfer to the agricultural sector. Together with the vision 20: 2020, the overarching framework that guides agriculture, food and nutrition security in Nigeria is the National Agriculture and Food Security Strategy (NAFSS, 2010-2020), which is now embedded in the Agriculture Transformation Agenda (2013-2015). The agenda was launched in 2011 to diversify the economy and enhance foreign exchange earnings, with the objective of achieving a hunger-free Nigeria through an agricultural sector that drives equitable income growth and distribution, accelerates the achievement of food and nutrition security, generates decent employment and transforms Nigeria into a leading player in global food markets. These two strategic frameworks have provided the basis for the CAADP National Agricultural Investment Plan (NAIP, 2011-2014), which seeks to enhance agro-industrialization and employment; and the National Agriculture and Food Security Programme, which seeks to increase agricultural output and rural household incomes.

In 2016, the Government of Nigeria developed the Green Alternative: The Agriculture Promotion Policy (APP, 2016-2020), which considers the agricultural sector a key instrument to long-term economic growth. It aims to prioritize specific crops; assist agricultural growth through private sector-led business; strengthen commodity value chains; improve market orientation through infrastructure and commodity exchanges; mainstream climate change measures and environmental sustainability into agricultural development; and implement nutrition interventions for vulnerable groups [39, 40].

In 2017, the Government of Nigeria launched the Synthesis Report of the Nigeria zero hunger strategic review, a strategic plan and road map to achieve Sustainable Development Goal 2 (end hunger, achieve food security and improved nutrition, and promote sustainable agriculture) by 2030. Furthermore, the government formulated the Economic Recovery and Growth Blueprint (ERGP 2017) as the new medium-term plan to tackle the economic crisis, restore growth, and ensure sustainable and inclusive growth. Concerning social protection, in 2015 the government drafted the National Social Protection Policy, which aims to reduce poverty; improve the management of social protection projects and programmes; ensure access to basic social services and infrastructure; enhance social welfare and improve food security and nutrition; support decent employment and sustainable livelihoods; protect households from shocks; and foster coordination among all social protection intervention agencies. With regard to nutrition, in 2016 the government developed the National Policy on Food and Nutrition, which aims at reducing hunger and malnutrition through a multi-sectoral and multidisciplinary approach encompassing various interventions at the community and national levels. By 2025, Nigeria expects to halve the proportion of people who suffer from hunger and malnutrition; decrease the stunting rate among under-five children; decrease the incidence of malnutrition among victims of emergencies; achieve universal access of all school children to school feeding programmes; and increase access to potable water.

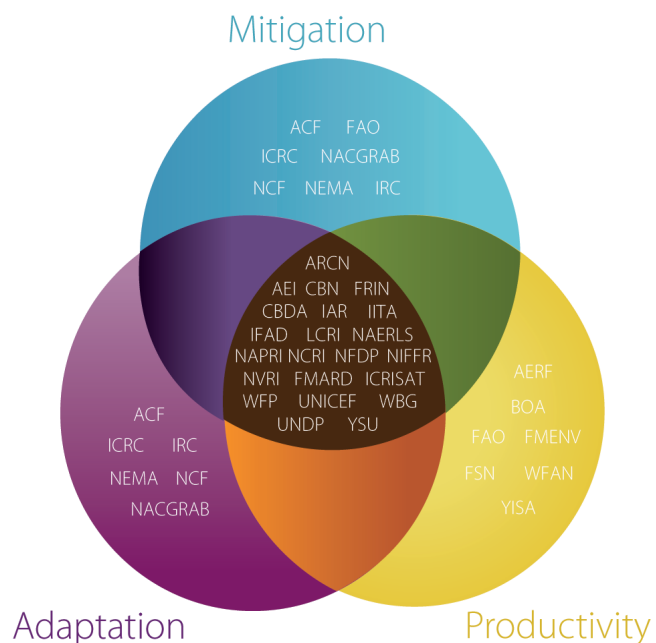
Few other policies, plans and strategies directly addressing one or more pillars of CSA at the Federal and state levels include:

- The National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN) prepared by the Building Nigeria's Response to Climate Change (BNRCC) project for the Special Climate Change Unit of the Federal Ministry of Environment in 2011 seeks to minimize risks, improve local and national adaptive capacity and resilience, leverage new opportunities, and facilitate collaboration with the global community.
- The Federal executive council of Nigeria in 2012 approved the adoption of a National Policy on Climate Change and Response Strategy (NPCCRS) as a national document for implementing climate activities in the country. The policy is meant to guide economic and social response of Nigerians to the global trend of climate change. The policy focuses on adaptation, mitigation, finance and technology [41].
- Nigeria is also a signatory to the Kyoto Protocol and ratified the United Nations Framework Convention on Climate Change (UNFCCC) becoming a contracting Party to the Convention, committed to develop, update, publish the National Communications on Climate Change and other strategic documents on the same theme and participate in the Conferences of the Parties (COP).

- The National Forest Policy is geared towards ensuring sustainable forest management, promoting participatory process of development, facilitating private sector – forestry development and adopting an integrated approach to forestry development. Government is currently embarking on a number of afforestation programmes. Under the guidance of the African Union Commission, Nigeria is keying into the project on the “Green Wall Initiative” in which a “green wall” of trees (40 million trees annually in the next 10 years) will be planted across the dry-land area of Nigeria to not only push back deforestation and secure agriculture and livelihoods across the Sudano-Sahelian zone of the country, but also enhance the carbon sequestration of biological diversity resources in the region for climate change mitigation [42].
- The National Policy on Drought and Desertification, in particular, recognizes that climate change could intensify drought and desertification in the part of the country that are very prone to these environmental problems. Thus the policy emphasized the need to equip relevant agencies, institutions and citizens adequately to collect, analyze and use climate data effectively to ameliorate and combat drought and desertification. Specific implementation strategies for the policy include: (i) strengthening of agencies, institutions and facilities for the collection and analyses of meteorological and hydrological as well as for dissemination of information; (ii) upgrading the existing national early warning facilities for more efficient service delivery; (iii) developing appropriate awareness programmes for formal and informal education to enhance knowledge on climate and environment issues; and (iv) encouraging appropriate land use that enhances carbon dioxide sequestration, such as afforestation, reforestation and agro-forestry. This also reduces soil erosion and increase crop productivity for economic development [42].
- Agricultural Promotion Policy: The main objectives of the Nigerian Agricultural Promotion Policy include: (i) the achievement of self-sufficiency in basic food supply and the attainment of food security; (ii) increased production of agricultural raw materials for industries; (iii) increased production and processing of export crops, using improved production and processing technologies; (iv) generating gainful employment; (v) rational utilization of agricultural resources, improved protection of agricultural land resources from drought, desert encroachment, soil erosion and flood, and the general preservation of the environment for the sustainability of agricultural production; (vi) promotion of the increased application of modern technology to agricultural production; and, (vii) improvement in the quality of life of rural dwellers [40].

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.

### Institutions for CSA in Yobe



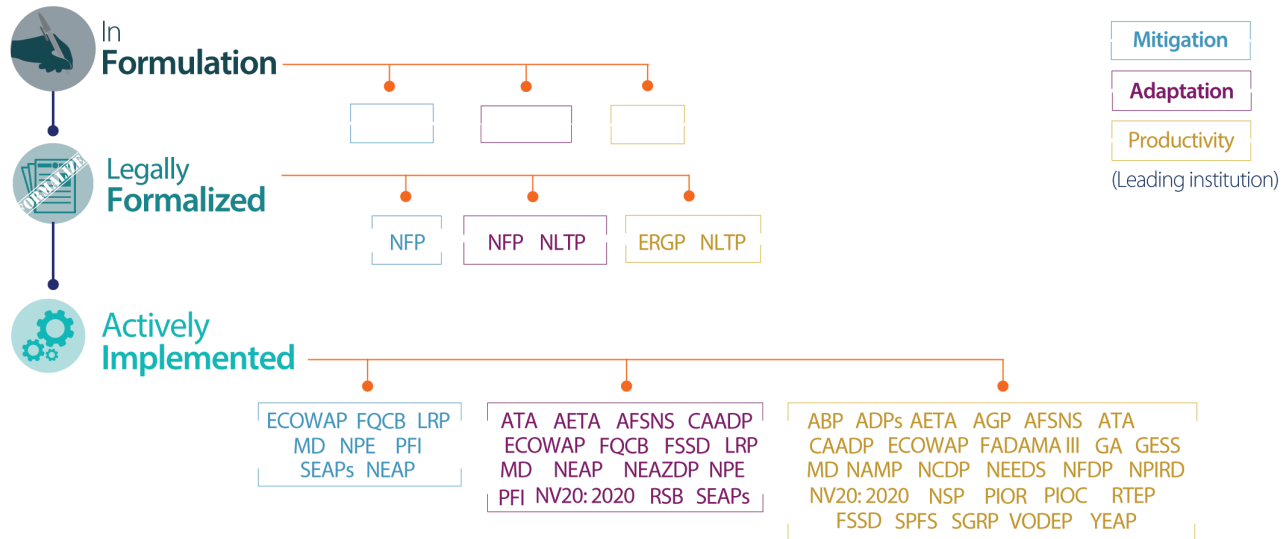
ARCN Agricultural Research Council of Nigeria ACF Action against Hunger AEI Agricultural Educational Institutions AERF African Ecological Restoration Foundation ARCN Agricultural Research Council of Nigeria BOA Bank of Agriculture CBDA Chad Basin development Authority CBN Central Bank of Nigeria FAO Food and Agricultural Organization of the United Nations FMARD Federal Ministry of Agriculture and Rural Development FMENV Federal Ministry of Environment FRIN Forestry Research Institute of Nigeria FSN Fisheries Society of Nigeria IAR Institute of Agricultural Research ICRC International Commission on Red Cross ICRISAT International Crops Research Institute for the Semi-Arid Tropics IFAD International Fund for Agricultural Development IITA International Institute of Tropical Agriculture IRC International Rescue Committee LCRI Lake Chad Research Institute NACGRAB National Centre for Genetic Resources and Biotechnology NAERLS National Agricultural Extension, Research, and Liason Service NAPRI National Animal Production Research Institute NCF Nigerian Conservation Foundation NCRI National Cereals Research Institute NEMA National Emergency Management Authority NFD National Fadama Development Project NIFFR National Institute for Freshwater fisheries Research NVRI National Veterinary Research Institute UNDP United Nations Development Programme UNICEF United Nations International Children’s Emergency Fund WBG World Bank Group WFAN Women Farmers Advancement Network WFP World Food programme YISA Youth Initiative for Sustainable Agriculture YSU Yobe State University



The graphic shows a selection of policies, strategies and programs that relate to agriculture and climate change topics and are considered key enablers of CSA in the country. The policy cycle classification aims to show gaps and opportunities in policy-making, referring to the three main stages: policy formulation (referring to a policy that is in an initial formulation stage/consultation process), policy

formalization (to indicate the presence of mechanisms for the policy to process at national level) and policy in active implementation (to indicate visible progress/outcomes toward achieving larger policy goals, through concrete strategies and action plans). For more information on the methodology and results from interviews, surveys and expert consultations, see annex 6.

### Policies for CSA in Yobe



**ADPs** Agricultural Development Programme (2008) **AETA** Agricultural Extension Transformation Agenda (2011) **AFSNS** Agriculture Food Security and Nutrition Strategy (2017) **AGP** Agricultural Promotion Policy (2016) **ATA** Agricultural Transformation Agenda (2011) **CAADP** Comprehensive Africa Agriculture Development Program (2014) **ECOWAP** ECOWAS Agriculture Policy (2014) **ERGP** Economic Recovery Growth Plan (2017) **FADAMA III** Fadama III Programme (2008) **FSS** Food Security Strategy (2009) **FSSD** Food Security Strategy Document (2009) **FQCB** Fertilizer Quality Control Bill (2019) **GA** Agriculture Promotion Policy (APP), Green Alternative (2016) **GESS** Growth Enhancement Support Scheme (2011) **LRP** Land Resources Policy (2009) **MD** Malabo declaration (2014) **NAMP** National Agricultural Mechanisation Policy (2009) **NCDP** National Cooperative Development Policy (2009) **NEAP** Nigerian National Environmental Action Plan (1995) **NEAZDP** North East Arid Zone Development Programme (1988) **NEEDS** National Economic Empowerment and Development Strategy (1999) **NFDP** National Fadama Development Project (1990) **NFP** National Forest Policy (2018) **NLTP** National Livestock Transformation Plan (2019) **NPE** National Policy on Environment (1989) **NSP** National Seed Policy (2009) **NV20:2020** Nigerian Vision 20: 2020 (2009) **NPIRD** National Policy on Integrated Rural Development (2009) **PFI** Presidential Fertilizer Initiative (2016) **PIOC** Presidential Initiative on Cassava (2002) **PIOR** Presidential Initiative on Rice (2002) **RTEP** Root And Tuber Expansion Programme (2003) **RSB** Revised Seed Bill (2017) **SEAPs** States Environmental Action Plans (1995) **SGRP** Strategic Grains Reserve Programme (2015) **SPFS** Special Programme for Food Security (2008) **VODEP** Presidential Initiative on Vegetable Oil Development (2002) **YEAP** Youth Employment in Agriculture Programme (2014)

## Financing CSA

Financing CSA activities in the Yobe state is presently the prerogative of implementing agencies across the state. There are limited concrete linkages with funding organizations at the bilateral and multi-lateral levels in support of CSA. There are, however, donor-supported climate change projects at the Federal level that benefits the state. Presently, the United Nations Development Programme, United Nations Environment Programme, Food and Agriculture Organization of the United Nations, the World Bank and the African Development Bank have supported CSA-related initiatives and agricultural development projects that are geared towards rural livelihood improvement and food security in the Yobe state.

Nationally, the Government of Nigeria is taking pragmatic measures to devote significant proportions of national budget to climate change especially in sectors of the economy like agriculture deemed highly vulnerable to climate change and variability. While Nigeria has been able to obtain funding from the Global Environment Facility Trust Fund for climate change-related projects in other states, very less can be said of the Yobe states.

## Potential finance

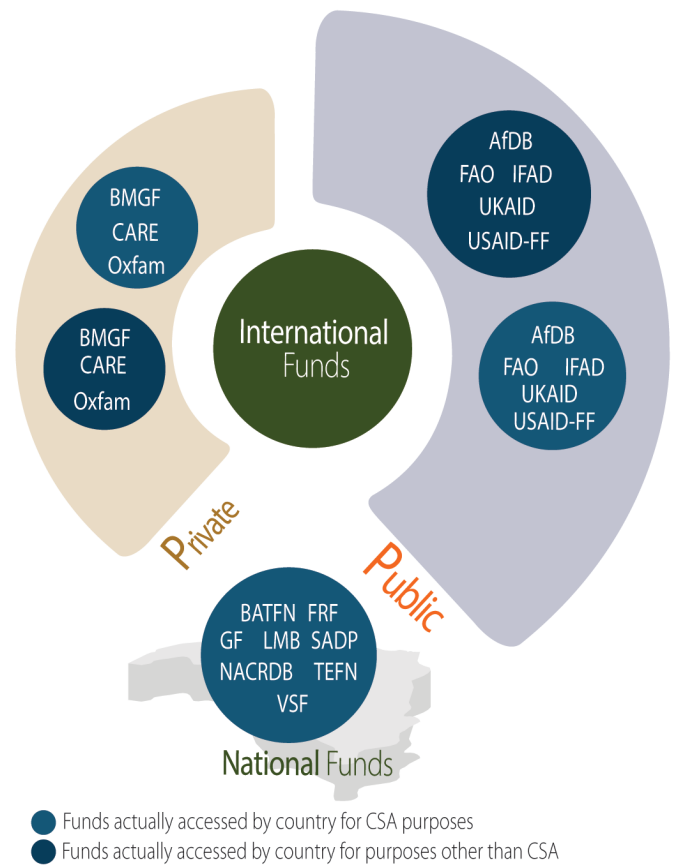
Yobe state may not have sourced a lot of funding from climate finance initiatives like the Green Climate Fund and the Global Environment Facility. However, the vulnerability of the region to climate change and the rising need for the adoption of innovative agricultural technologies that avert the risks posed by climate change, makes projects seeking to improve climate change adaptation and rural livelihoods appealing to donors. At present, Federal Government support are not sufficient with the state counting mainly on local and international development agencies operating in the region. According to the Federal Ministry of Environment, the Federal Government is in the process of putting in place a Nationally Strategic Climate Change Trust Fund (NSCCTF) as a response to the need to broaden the scope of national interventions for impact at all levels of governance. The scope of the NSCCTF is said to be broad to cover many activities related to climate change and sustainable development in Nigeria. Agricultural stakeholders in the Yobe state seeking to design projects that have the potential to strengthen agricultural production systems (crop and livestock) and improve their resilience to climate change-induced weather extremes such as drought are likely to benefit from this funding scheme.

There have also been discussions on setting up an agricultural resilience fund that Yobe state can benefit. The Bill to set up the National Climate Change Commission provides for "a fund into which all the monies accruable to the Commission shall be paid and from which all the activities of the Commission shall be funded". This is the equivalent of a Climate Fund and would provide a pot from which the various economic sectors, including agriculture, could obtain their finances.

But there should also be a separate agricultural resilience fund to complement the National Climate Change Commission provision. Indeed, the National Policy on Climate Change explicitly recognizes the need for individual sectors to pursue additional measures against climate change. Categorizing agriculture as a business invites greater involvement by the private sector in building finances to tackle climate change and develop climate-resilient agriculture. The private sector has many comparative advantages, including organized structures, experience, money and trained personnel, and will engage constructively in efforts to mitigate the shocks and stresses imposed by the changing climate. It understands the marketability and the profitability of climate-resilient agriculture and is willing to back that appreciation with the necessary level of investment.

The graphic highlights existing and potential financing opportunities for CSA in the Yobe state of Nigeria. The methodology and a more detailed list of funds can be found in annex 7.

## Financing opportunities for CSA in Yobe



AfDB African Development Bank BATFN British American Tobacco Foundation of Nigeria BMGF Bill and Melinda Gates Foundation CARE Cooperative for Assistance and Relief Everywhere FAO Food and Agriculture Organization of the United Nations FRF Fertilizer Revolving Fund GF Guinness Foundation IFAD International Fund for Agricultural Development LMB LAPO Microfinance Bank NACRDB Nigerian Agricultural, Cooperative and Rural Development Bank SADP State Agricultural Development Programme SCCC Special Climate Change Fund TEFN The Tony Elumelu Foundation of Nigeria UKAID United Kingdom Aid UNDP United Nations Development Programme UNEP United Nations Environmental Programme USAID-DGP United States Agency for International Development – Feed the Future VSF Victims Support Foundation

## Outlook

Agriculture is the mainstay for Yobe state's economy employing over 80 percent of the population. Agricultural practices are mainly rain fed and irrigated as characterized by two distinct wet and dry seasons and by small land holdings rarely exceeding 5 hectares per household. There exist low input systems with maize, sorghum, rice, cowpea, soya bean, groundnut as major food crops and cotton, gum arabic, sesame and groundnut as major cash crops. Major livestock include cattle, sheep, goat, and camels. Yet the agriculture sector is struggling to meet the food security needs of its growing population particularly in the face of highly variable weather and changes in climate.

Factors such as declining soil fertility, poor financial services, land tenure complications, limited infrastructure and underdeveloped markets continue to hamper agricultural growth. This notwithstanding the Yobe state and indeed Nigeria has made efforts to enhance the resilience of the agriculture sector to climate change. The ongoing development of the Agricultural Promotion Policy (APP), the development of a National Policy on Climate Change and Response Strategy (NPCCRS) and the numerous plans, strategies and policy enabling environment are thought to set the state on the path towards sustainable development under the realities of a changing and varying climate.

Some CSA practices (e.g. micro-dosing, intercropping/multiple cropping, agroforestry, conservation agriculture etc.) are quite widespread and their proliferation has been facilitated by ease of adoption, and multiple benefits such as food, income diversification and improved resilience. Although there are a wide range of organizations conducting CSA-related work, most have focused largely on food security, environmental management and adaptation. There is the need to also integrate mitigation into the State's climate-smart agriculture development efforts. In addition, off-farm services related to CSA need to be enhanced, including weather-smart and market-smart services.

While funding for CSA is limited in the state and Nigeria in general, efforts are underway to ensure that the country access and utilize international climate finance from sources such as the Green Climate Fund and Global Environment Facility and through readiness and capacity building programmes. At the national level, the National Agricultural Resilience in Nigeria, an arm of the Federal Ministry of Agriculture and Rural Development which targets reforestation, agriculture and livestock, is a useful mechanism for directing climate finance to CSA-related activities. Others are the fund set aside for the National Climate Change Adaptation Strategy and Action Plan for Climate Change in Nigeria (NASPA-CCN) which can benefit CSA-related activities the Yobe state.

## Works cited

- [1] **FAO.** 2010. "Climate-Smart" Agriculture. Policies, practices and financing for food security, adaptation and mitigation. Rome: Food and Agriculture Organization of the United Nations (FAO).
- [2] **FAO.** 2013. Climate-smart agriculture sourcebook. Rome: FAO.
- [3] **YSSBY.** 2017. Yobe State Statistical Year Book, Yobe, Nigeria.
- [4] **NBS.** 2019. Nigerian Bureau of Statistics. Demographic statistics Bulletin, 26p
- [5] **FAO.** 2018. FAOSTAT Database. Available at: <http://faostat3.fao.org/download/Q/QV/E>
- [6] **UKaid.** 2018. MNCH2 Monthly Flash Report. Available at: [http://www.mnch2.com/wp-content/uploads/2018/01/2018-12-Monthly-Flash-Report\\_Yobe\\_December-2018.pdf](http://www.mnch2.com/wp-content/uploads/2018/01/2018-12-Monthly-Flash-Report_Yobe_December-2018.pdf)
- [7] **Nigeria Data Portal.** Available at: <http://nigeria.opendataforafrica.org/apps/atlas/Yobe/Poverty-Incidence>
- [8] **UNDP.** 2018. Available at: [http://hdr.undp.org/sites/default/files/hdr\\_2018\\_nigeria\\_finalfinalx3.pdf](http://hdr.undp.org/sites/default/files/hdr_2018_nigeria_finalfinalx3.pdf)
- [9] **UNDP.** 2016. Available at: [https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/assessments/undp\\_report\\_update\\_livelihoods\\_economic\\_reovery\\_assessment\\_final.pdf](https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/assessments/undp_report_update_livelihoods_economic_reovery_assessment_final.pdf)
- [10] **World Bank.** 2017. A Wake Up Call: Nigeria Water Supply, Sanitation, and Hygiene Poverty Diagnostic. WASH Poverty Diagnostic. World Bank, Washington, DC.
- [11] **World Bank.** 2018. World Development Indicators. Washington, D.C: World Bank. Available at: <http://data.worldbank.org/>
- [12] **FFP B3E Project.** 2018. Available at: [https://fscluster.org/sites/default/files/documents/ffp\\_b3e\\_value\\_chain\\_analysis\\_in\\_yobe\\_state\\_-\\_key\\_findings.pdf](https://fscluster.org/sites/default/files/documents/ffp_b3e_value_chain_analysis_in_yobe_state_-_key_findings.pdf)
- [13] **Amaza, P., Abdoulaye, T., Kwaghe, P. and Tegbaru, A.** 2009. Changes in household food security and poverty status in PROSAB area of Southern Borno State, Nigeria. IITA, Ibadan, Nigeria.
- [14] **Abdullahi, H.G., Fullen, M.A., Oloke, D.** 2016. A review of socio-economic effects of drought in the semi-arid Sahel. International Journal of Advances in Engineering and Technology. 1, 95-99.
- [15] **FAO.** 2016. Seeds Security Assessment in North Eastern States of Nigeria. Rome: FAO.

- [16] **Saleh, A.** 2014. Loss of Agricultural Productivity and Biodiversity in Semi-Arid Environment of North Eastern Nigeria. *International Research of Applied and Natural Sciences*. 1(3):29-37.2014.
- [17] **CountryStat.** 2018. Available at : <http://countrystat.org/home.aspx?c=NGA&tr=21>
- [18] **WFP.** 2017. Emergency Food Security Assessment in Three North Eastern States (Borno, Yobe and Adamawa) of Nigeria. Available at <https://docs.wfp.org/api/documents/WFP-0000062431/download/>. Accessed 17th April 2019
- [19] **NBS.** 2014. National Bureau of Statistics, Second Quarter Report, 2014.
- [20] **NACA.** 2018. National Agency for the Control of Aids Report, 2018. <https://naca.gov.ng/nigeria-prevalence-rate/>. Accessed on 29/01/2019.
- [21] **FAO/AQUASTAT.** 2019. Available at: <http://www.fao.org/nr/water/aquastat/data/query/results.html>
- [22] **MA.** 2015. Yobe State ministry of agriculture
- [23] **HIVAIDS.** 2019. Available at: <http://nigeria.opendataforafrica.org/apps/atlas/Yobe/HIVAIDS-prevalence-rate>
- [24] **USAID.** 2019. Available at : <https://www.usaid.gov/nigeria/food-assistance>
- [25] **FoodSecurity.** 2019. Available at : <http://www.foodsecurityportal.org/api/countries/calorie-supply-per-c?page=2>
- [26] **Spore.** 2015. Climate change challenges and opportunities. Towards 2050: No time to waste. Spore magazine special issue, October, 2015. <http://spore.cta.int>
- [27] **Nwajiuba, C. U.** 2012. Does agriculture have a future in southeast Nigeria. Imo State University Owerri, Nigeria. Inaugural Lecture, Series, (5), 50.
- [28] **FAO.** 2019. Available at: <http://www.fao.org/faostat/en/#data/GT>
- [29] **ClimateWatch.** 2014. Available at: <https://www.climatewatchdata.org/countries/CPV>
- [30] **NIMET.** 2017. Available at: <https://www.worldweatheronline.com/potiskum-weather-averages/yobe/ng.aspx>
- [31] **Giller, K.E., Witter, E., Corbeels, M. and Tiftonell, P.** 2009. Conservation agriculture and smallholder farming in Africa: the heretics' view. *Field crops research*, 114(1), pp.23-34.
- [32] **Wouterse, F.** 2017. Empowerment, climate change adaptation, and agricultural production: evidence from Niger. *Climatic Change* 145: 367. <https://doi.org/10.1007/s10584-017-2096-8>
- [33] **Sawadogo, H.** 2011. Using soil and water conservation techniques to rehabilitate degraded lands in northwestern Burkina Faso. *International journal of agricultural sustainability*, 9(1), 120-128.
- [34] **Lahmar, R., Bationo, B. A., Lamso, N. D., Guéro, Y., & Tiftonell, P.** 2012. Tailoring conservation agriculture technologies to West Africa semi-arid zones: building on traditional local practices for soil restoration. *Field crops research*, 132, 158-167.
- [35] **Masse, M.** 2011. REST API Design Rulebook: Designing Consistent RESTful Web Service Interfaces. " O'Reilly Media, Inc."
- [36] **Slingerland, M. A., & Stork, V. E.** 2000. Determinants of the practice of Zai and mulching in North Burkina Faso. *Journal of Sustainable Agriculture*, 16(2), 53-76.
- [37] **Schuler, J., Ndah, H. T., Uthes, S., Zander, P., Triomphe, B., Mkomwa, S., & Corbeels, M.** 2015. Adoption potential for conservation agriculture in Africa: a newly developed assessment approach (QAToCA) applied in Kenya and Tanzania. *Land Degradation & Development*, 26(2), 133-141.
- [38] **Badu-Apraku, B., Fakorede, M. A. B., Menkir, A., & Sanogo, D.** 2012. Conduct and management of maize field trials.
- [39] **FMARD.** 2015. National Agricultural Resilience Framework. A report by the advisory committee on agricultural resilience in Nigeria. Federal ministry of agriculture and rural development. 136 Pp.
- [40] **FMARD.** 2016. Agriculture Promotion Policy (2016-2020): Building on the successes of ATA, closing key gaps. Policy and Strategy Document, Federal Ministry of Agriculture and Rural development, Nigeria. 59 Pp.
- [41] **NNPC.** 2014. Nigerian National Petroleum Corporation
- [42] **FMENV.** 2010. National Action Programme to Combat Desertification. Federal Ministry of Environment, Abuja, Nigeria. Available at <https://knowledge.unccd.int/sites/default/files/naps/nigeria-eng2001.pdf>. Accessed 17th April 2019



For further information and online versions of the annexes

**Annex 1:** Yobe's agro-ecological zones

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

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

**Annex 4:** Long list of CSA practices adopted in the Yobe state of Nigeria

**Annex 5:** Institutions for CSA in the Yobe state of Nigeria (methodology and results)

**Annex 6:** Policies for CSA in the Yobe state of Nigeria (methodology and results)

**Annex 7:** Assessing CSA finances

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FAO and ICRISAT. 2019. Climate-Smart Agriculture in the Yobe State of Nigeria. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT); International Crops Research Institute for the Semi-Arid Tropics (ICRISAT); Food and Agriculture Organization of the United Nations (FAO). Rome, Italy. 22p.

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