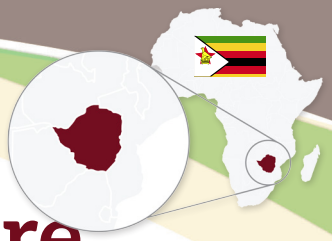

Climate-Smart Agriculture in Zimbabwe

Climate-smart agriculture (CSA) considerations

A P Agriculture is the mainstay of Zimbabwe's economy, yet recurrent droughts and the impact of climate change through temperature increases and reduced rainfall are already negatively affecting Zimbabwe's agricultural sector particularly due the high reliance on rainfed crop production

M The livestock sector is largest source of agricultural GHG emissions at 71% followed by cropland at 29%. In livestock, emissions are mostly from enteric fermentation (38.6%) and manure left on pastures (28.4%). In crops, high emissions emanate from savanna burning (20.5%), compounded by deforestation from tobacco production and curing by smallholder farmers, while burning of sugarcane fields before harvest is also common.

A M P Against a backdrop of securing national food security and projections that all production systems are expected to be somewhat negatively affected by climate change, the adoption of Climate-Smart Agriculture (CSA) as an agricultural adaptation and mitigation strategy is increasingly becoming important.

A M I Conservation agriculture is the most widely promoted CSA practice (over 100,000 farmers practicing on over 125,000 hectares). Other CSA activities that have potential for scaling up and out include seed multiplication of drought tolerant crops, small scale irrigation, and agroforestry. Efforts are needed to reduce the frequency of veldt fires through improved savanna and grassland management. Soil based CSA practices such as precise fertilizer application, manure application, agroforestry, crop rotations and intercropping, along with soil conservation structures are also important.

A M I For livestock production, the main climate-smart practices include fodder management and conservation, water harvesting and manure management including biogas production. Rearing of small livestock (such as goats) is also increasingly common as an adaptation strategy. However, animal health management, improved breeds and improved feed have the most potential to enhance resilience in the sector.

I $ The agriculture sector requires USD $2.3 billion for implementation of the proposed adaptation and mitigation action plans in the country's Climate Change Response Strategy. However, financing for CSA projects is constrained by the limited government funding toward agriculture and limited enabling conditions for leveraging capital investments. Public and private sector partnership are needed to ensure adequate financing for CSA practices.

A M P I Services to support CSA have included weather index based crop and livestock insurance and provision of improved climate information targeted at smallholder farmers, through use of information technology (particularly cell phones). More could be done to promote private sector involvement in building the capacity of a variety of stakeholders to understand, use and demand appropriate climate information to support agricultural adaptation efforts.

I $ There is potential to access international financing for CSA, particularly through the Green Climate Fund (GCF) and the Adaptation Fund (AF) both of which the country has not yet accessed. In addition, there is opportunity to access the Extreme Climate Facility set by the African Union to support adaptation practices on the continent.

I $ Capacity building of government and non-governmental organizations involved in CSA activities is required for Zimbabwe to write bankable proposals and access the various funding streams for climate change adaptation and mitigation projects.

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

The climate-smart agriculture (CSA) concept reflects an ambition to improve the integration of agriculture development and climate responsiveness. It aims to achieve food security and broader development goals under a changing climate and increasing food demand. CSA initiatives sustainably increase productivity, enhance resilience, and reduce/remove greenhouse gases (GHGs), and require planning to address trade-offs and synergies between these three pillars: productivity, adaptation, and mitigation [1]. The priorities of different countries and stakeholders are reflected to achieve more efficient, effective, and equitable food systems that address challenges in environmental, social, and economic dimensions across productive landscapes. While the concept is new, and still evolving, many of the practices that make up CSA already exist worldwide and are used by farmers to cope with various production risks [2]. Mainstreaming CSA requires critical stocktaking of ongoing and promising practices for the future, and of institutional and financial enablers for CSA adoption. This country profile provides a snapshot of a developing baseline created to initiate discussion, both within countries and globally, about entry points for investing in CSA at scale.

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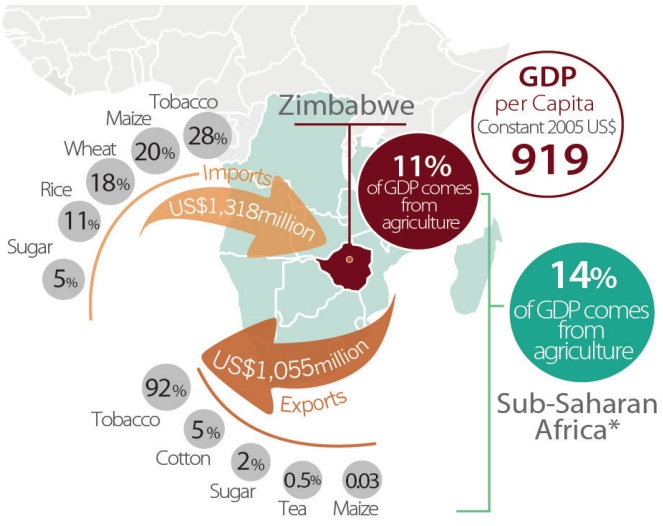
National context

Economic relevance of agriculture

Zimbabwe is an agro-based country with the country's population largely living in rural areas. Agriculture underpins the country's economic growth, food security and poverty reduction with approximately 70 percent of the population depending directly or indirectly on agriculture as a livelihood [3]. The agricultural sector contributes an average of 11.3 percent (2012-2016 average) to annual GDP and 16 percent of the country's export earnings [4]. Zimbabwe's main agricultural products are maize, sorghum, millet, wheat, cassava, cotton, tobacco, coffee, sugarcane, peanuts and livestock (cattle, goats, sheep, pigs, chickens). Tobacco, sugarcane, maize and cotton are the main agricultural exports. Tobacco and cotton contribute 25 and 12.5 percent respectively to gross domestic product. Food imports (particularly maize, wheat and rice) have been on the rise due to the poor macro-economic environment in the country and the effects of climate extremes such as droughts and floods that result in significant agricultural losses. Various "minor crops" such as legumes (Bambara/ round nuts, ground peas and ground nuts), tubers (potato and sweet potato), leafy green vegetables and beans (sugar) are produced by smallholder farmers and are critical for food security and nutrition.

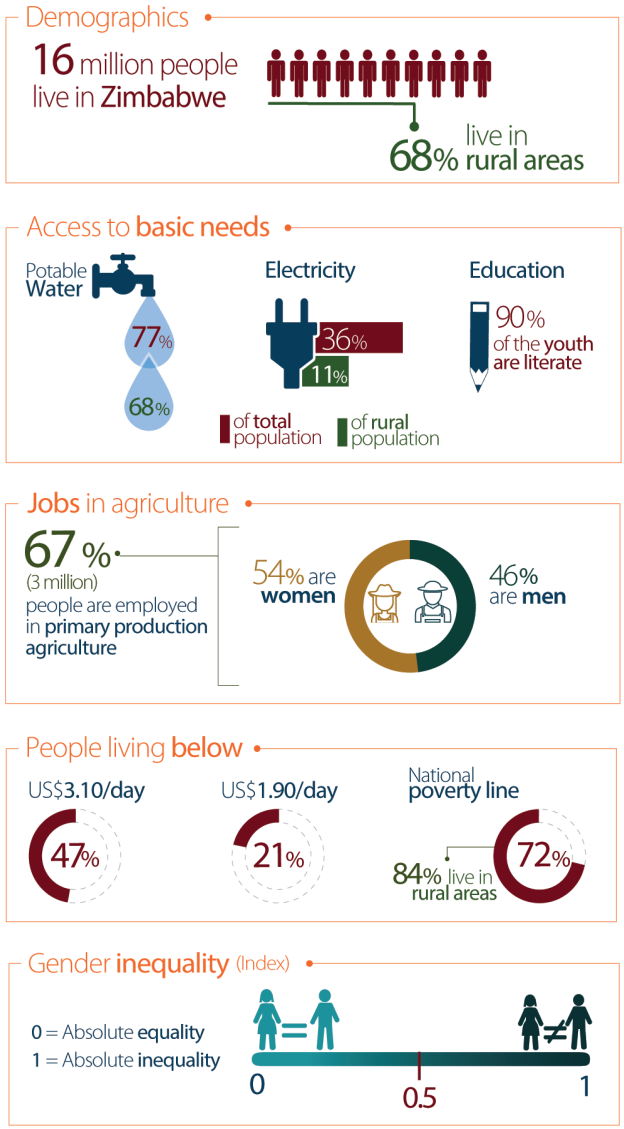
Zimbabwe's population increased from 13.1 million in 2012 to approximately 16.1 million in 2016 [5, 37]. Of this population there are seven million economically active persons and approximately 52.3 percent of these are small-scale communal, peri-urban and resettlement farmers, who are mostly dependent on climate-sensitive, rainfed, agro-based livelihoods [7]. The high dependence on natural resources by most of the population renders livelihoods of rural communities highly vulnerable to the negative impacts of climate change [4]. Women constitute 55 percent of the agricultural labor force, mostly as unpaid family labor.

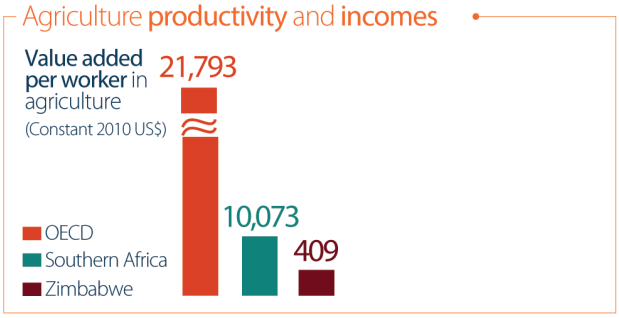
Economic relevance of agriculture in Zimbabwe [5, 6]



*Southern Africa: Botswana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia

People, agriculture and livelihoods in Zimbabwe [4, 5, 6, 8, 9]





Land use

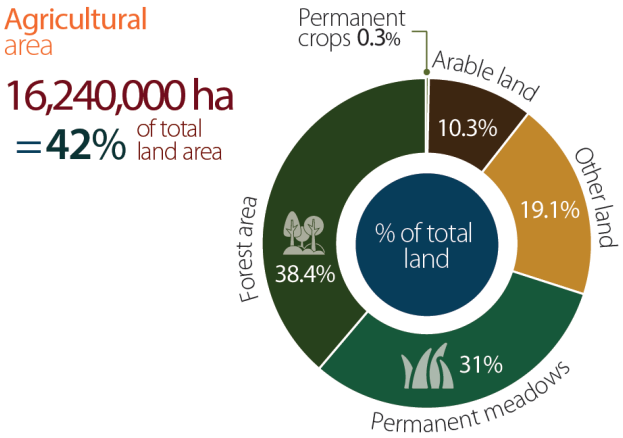
Zimbabwe is a landlocked country covering an area of 390,757 square kilometers (km^2) and has a population density of 33 people per square kilometer. Of the 39.6 million hectares of land, about 42.1 percent is utilized for agriculture. Approximately 365,000 hectares of land are suitable for irrigated agriculture, however less than half of this (175000 ha) is currently equipped for irrigation and only 71% of this (123,000 ha) is currently irrigated mostly by commercial farmers but also by government and donor supported smallholder irrigation projects.

Forests comprise 38.4 percent of the country's land area, and include indigenous forests (miombo, mopane, teak, acacia and terminalia/combretum) and plantations[1] (mostly eucalyptus), the latter being mostly found in the Eastern Highlands. Apart from domestic energy, the growth in tobacco production across the country and the associated use of wood for tobacco curing has contributed to deforestation. The country has a unique topography, consisting of four major regions based on relief, namely, the Eastern Highlands, the highveld, middleveld and lowveld. This topography is closely linked to the country's agroecological zones (discussed in the next section) and greatly influences rainfall, temperature, land use, agricultural production and land degradation.

Agricultural production systems

The country is divided into five agro-ecological regions[2] (Annex 6) based on a combination of factors including rainfall regime, temperature and the quantity and variability of average rainfall, as well as soil quality and vegetation

Land use in Zimbabwe [6]



[11]. The suitability of cropping declines from Region I through to Region V. Rainfall ranges from above 1,050 mm to as low as 650 mm per annum in Regions I to III, while in Regions IV and V, rainfall is below 650 mm per annum [12]. Most agriculture is carried out in Regions I, II and III which have favourable climatic conditions for intensive crop and animal production, while extensive livestock production and irrigated crops (such as sugarcane[3]) are suitable in regions IV and V. Region I, is characterized by specialized and diversified farming including forestry, fruit production[4] and intensive livestock farming. In frost free areas of the region, plantation crops such as tea, coffee and macadamia nuts are grown.

Natural Region II constitutes 75-80 % of the area under crop production. The region is dominated by large scale highly mechanized farms of 1000-2000 ha. The main crops include flue-cured tobacco[5], small grains (sorghum) and irrigated crops grown in the colder and drier months such as wheat and barley. Natural region III is characterized by the occurrence of fairly severe mid-season dry spells and is dominated by semi-intensive smallholder farming. Maize and cotton[6] comprise the primary production systems in this region, in addition to drought-tolerant crops and semi-intensive livestock farming.

Region IV is characterized by periodic seasonal droughts and severe dry spells during the rainy season. The area is not suitable for dry land cropping but rather for livestock production. Regardless, smallholder farmers in the region grow drought-tolerant varieties of maize, sorghum, pearl millet and finger millet [13]. Region V is mostly located in the lowlands below 900 meters above sea level (m.a.s.l.), receiving erratic rainfall and suited to extensive livestock production and game ranching. The majority of the smallholder farmers are located in regions IV and V. The risks of crop failure in Regions IV and V are extremely high and crop yields are generally low.

1 Owned mainly by the State through the Forestry Commission and by multinationals.

2 Some studies suggest that increased variability of rainfall has resulted in an increase in the size of regions I, IV and V, and a shrinkage in the main food producing areas (Regions II and III) [10].

3 For example in Triangle Estate

4 For example, apples and bananas.

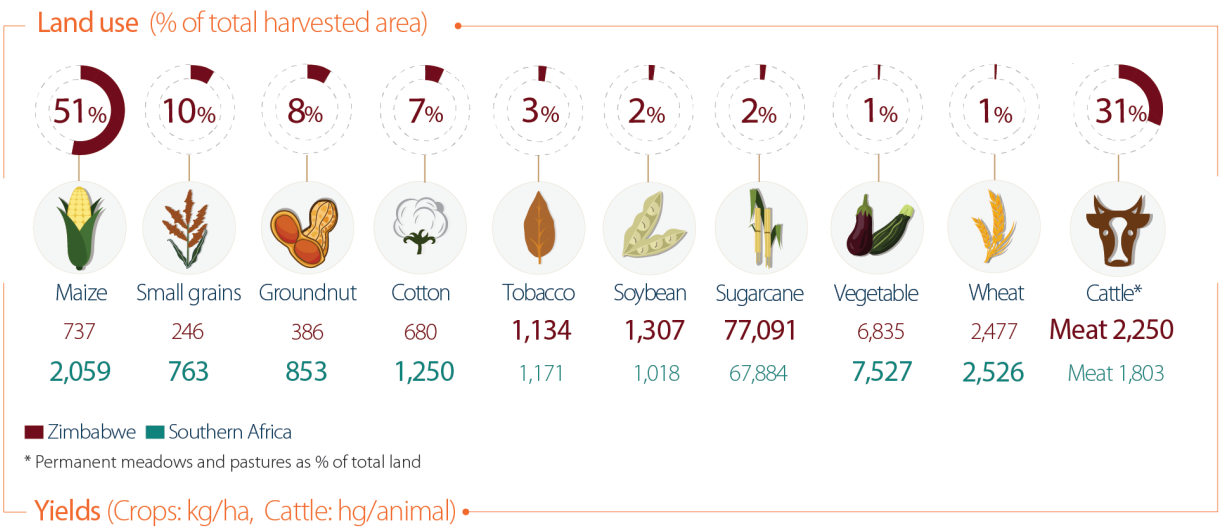
5 Tobacco is a key production system that requires CSA interventions given the deleterious effects of tobacco curing on woodlands and forests.

6 Cotton has been targeted for revival by the government.

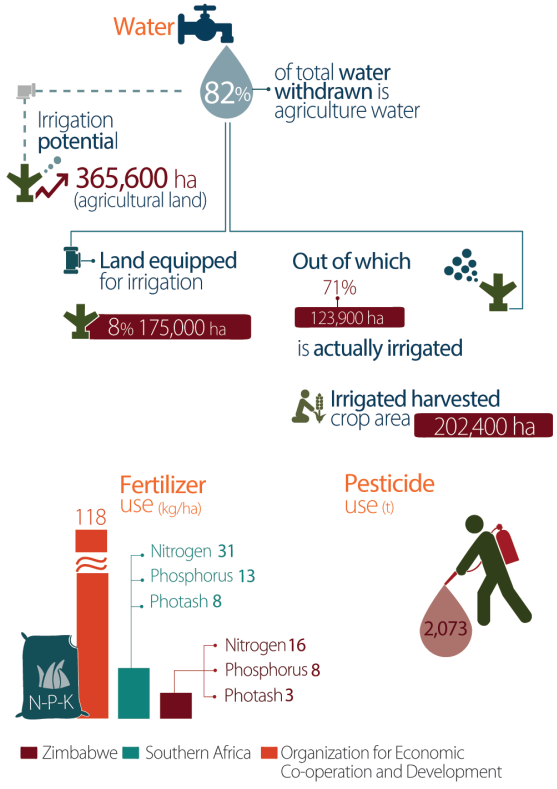
Zimbabwe's Fast Track Land Reform Programme (FTLRP) of 2000 changed the country's bi-model agrarian structure to a system that comprises four main farming categories: small-scale farms that include communal, old resettlement and A1 areas[7] (6-300ha) and peri-urban (15-50ha); medium-scale farms that include old small scale commercial farms, A2 commercial (150-1500ha); large-scale that include A2, black and white LSCF (250-2000ha); and agro-estates (>2000ha) [9]. The farm sizes vary according to the agro-ecological zones in which they are located. Smallholder farmers comprise 89 percent of the total farmers [9] and are mostly reliant on rain-fed agriculture.

The following infographic shows a selection of agricultural production systems considered key for food security in Zimbabwe. 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 1.

Production Systems Key for Food Security in Zimbabwe (6)



Agriculture input use in Zimbabwe (5, 6, 14)



Food security and nutrition

The incidence of food insecurity in Zimbabwe is a result of the interplay of progressive low/poor investment in the agricultural sector, poverty, the inelasticity of the food production sector, and climate related extremes [4], while price volatility and low incomes also play a role. In the last 15 years, there has been a significant decline in grain production in the country [15]. On the other hand good rains resulted in bumper maize harvests in the 2016/17 season. Nevertheless, the 2017 Global Hunger Index[8] (GHI), places Zimbabwe in the "serious category" with a score of 38.4. Zimbabwe has become a net importer of maize and is reliant on food aid, which accounts for at least one third of the total supply of maize in the market [15]. Food prices are highly volatile in the country, with price increases of 30-40 percent experienced during the lean season. Zimbabwe's national dietary diversity score stands at 5.5 from the range of 0 to 12 food groups that comprise the score. As a result, one in three people are malnourished, and high micronutrient deficiencies exist across all age groups, with high stunting (up to 30%) amongst children below the age of five [16, 17], although the country has made remarkable progress toward reducing underweight and wasting.

7 These small scale farms cover what is considered to be mostly subsistence peasantry farming. The A1 model is settlement variant under the FTLRP that has similar spatial structure and organization (residential, arable and communal grazing) to the communal areas).

8 The GHI scores for countries range from 0 (no hunger) to 100 (worst case scenario).

Food security, nutrition and health in Zimbabwe [5, 6, 18, 19, 20, 21]

Food security

Score 0-100*

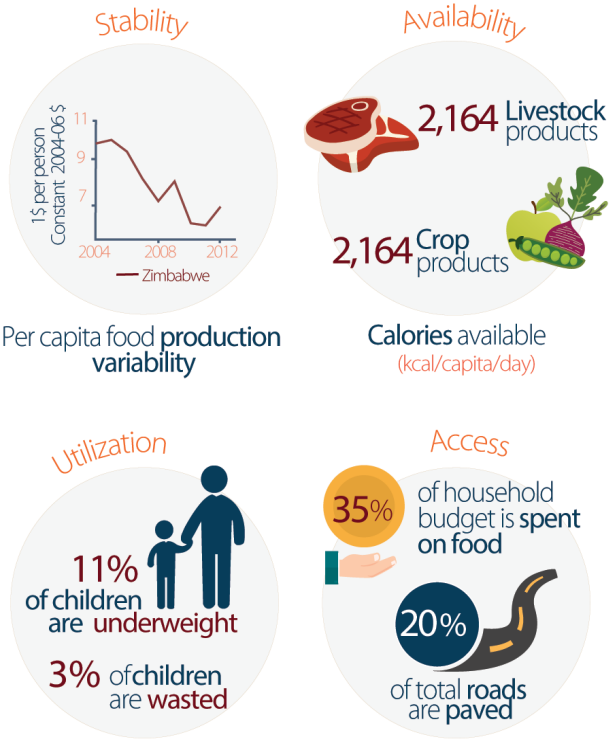
Global** 57

Sub-Saharan Africa 36

3 of 10 people is undernourished

* Takes into account aspects of affordability, availability, and quality
** Refers to the 113 countries included in the Index

Food security indicators (selection)



Food aid (2012)

37,331 metric tons (cereals 68%)

Emergency 32,669 mt

Project aid 4,662 mt

Changes in total food aid (from 2012 to 2011) -22%

Health

Access to clean energy sources

31% of the population has access to clean energy sources (non-solid fuels) for cooking

Child Mortality rate

Under-five mortality rate (per 1,000 live births): 7

Adolescent fertility rate

112 births per 1,000 women, ages 15-19

Prevalence of HIV infections

14% people infected with HIV

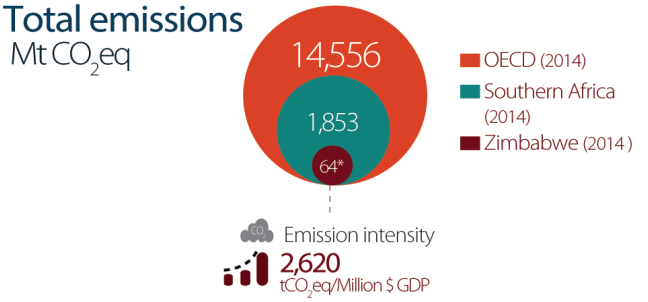
58% are women (age 15+)

Agricultural greenhouse gas emissions

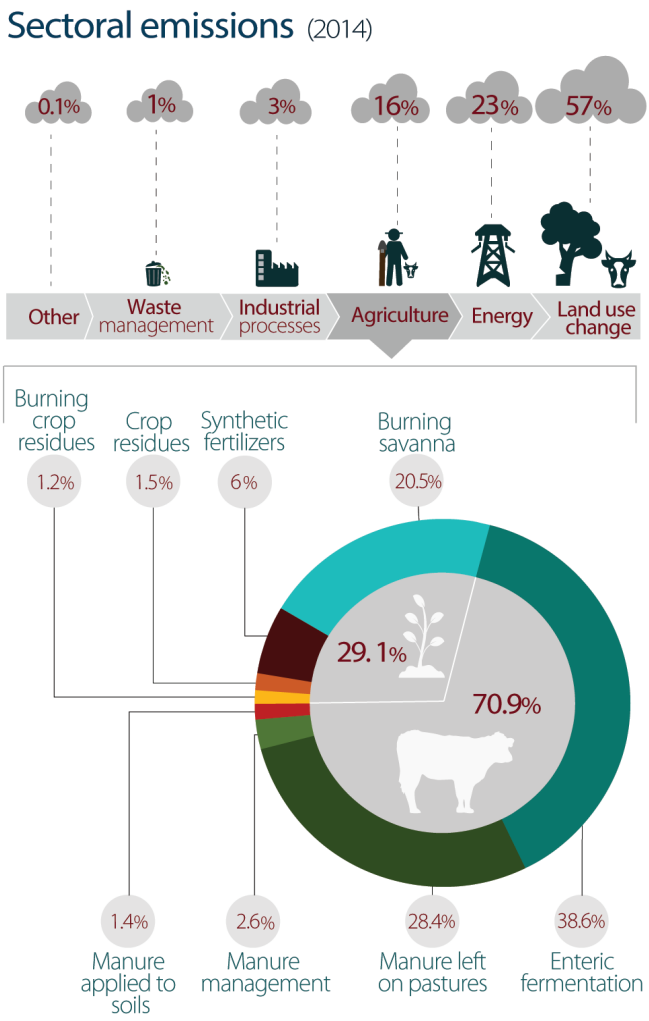
The total annual greenhouse gas emissions (GHG) for Zimbabwe is 63.79 mega tonnes (Mt) [5, 6, 22]. The agricultural sector is the third largest emitter in the country (16.3 percent of national emissions) after land-use change and forestry (56.5 percent), and energy (23.3%). Within the agriculture sector the livestock subsector accounts for the greatest GHG emissions (70.9 percent) followed by cropland (29.1 percent). Within the livestock subsector, enteric fermentation (38.6 percent) and manure left on pastures (28.4 percent) are key GHG emitters, while in cropping savannah burning for agricultural purposes (20.5 percent) is the largest emitter. Burning for land clearing is a main cause of veldt fires, while other causes include: honey gathering and hunting of small mammals. The burning of sugarcane fields before harvest is also a common practice.

Mitigation of GHG emissions from Zimbabwe's agricultural sector could be targeted at improved cattle management, improved feeds and feeding techniques, agricultural soil management and reduced burning of savannas [12]. Zimbabwe's Nationally Determined Contribution (NDC, 2015), commit the country to reducing emissions by 33 percent below the business as usual scenario (BAU) by 2030.

Greenhouse gas emissions in Zimbabwe (5, 6, 22)



* Includes emissions from land use change and forestry



Challenges for the agricultural sector

Projections indicate that current trends in population growth will continue, with population more than doubling from 13.1 million in 2012 to 29.6 million in 2050 and further increasing to 40.2 million in 2100 [23]. The rapid population growth of 2.8 percent per year [5] will likely exacerbate the competition for and degradation of the natural resource base, contribute to an increase in GHG emissions, and intensify vulnerability to climate-related hazards [6]. Already the country is experiencing food insecurity and has struggled to meet its strategic grain reserves (targeted at 500,000 tonnes in physical stock), especially in light of recurrent weather extremes such as droughts and prolonged dry periods.

Drought is a major challenge for agriculture, affecting both crops and livestock. In 2015 agricultural output fell by 5 percent and in 2016 by a further 3.6 percent [5]. Both these years were associated with drought conditions, with the recent 2015/16 El Nino-induced drought, which left 2.8 million people food insecure in the country [38].

Land degradation is a serious challenge in the country. Deforestation is a key risk factor to the natural environment and contributes to soil erosion. Most soils in the country are already acidic and highly leached (Acrisols) requiring proper soil fertility management to maintain and enhance production through practices such as integrated soil fertility management, erosion management, livestock management and irrigation water management.

Government's investment has continued to decline in critical sectors such as agricultural extension, disease control, irrigation, livestock and mechanization. National budget allocations for agriculture have consistently gone down, and the country's allocation of 6 percent is below the recommendation in the Maputo Agreement [24]. Critically, farmers lack access to finance from banks and microfinance institutes. The lack of land tenure security for smallholder farmers who acquired land under the FTLRP constrains access to finance, as this land cannot be used for collateral. The lack of title is a limiting factor for agrarian investment in A1 and A2 farms across the country [25].

The presence of crop and livestock pests and diseases is also a challenge, particularly given that climate change may cause changes in their range and occurrence. For example, 2016 saw the emergence of the fall armyworm which was not previously known in the country but can cause up to 70 percent maize crop losses if not managed.

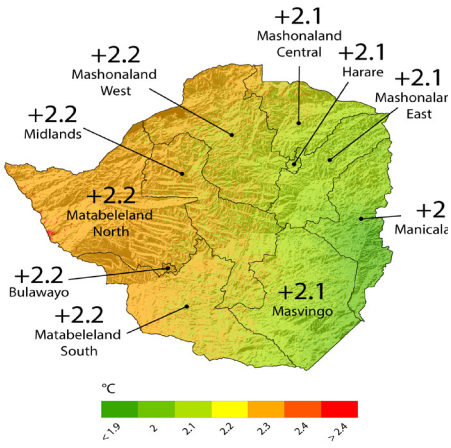
Agriculture and climate change

Zimbabwe is susceptible to an array of extreme weather events such as droughts, heatwaves, heavy rains, flash floods, strong winds and hailstorms [4][9]. Even though Zimbabwe's rainfall pattern has always exhibited spatial and temporal variability, the timing and amount of rainfall received are becoming increasingly uncertain [26]. There has been an overall decline of nearly 5 percent in rainfall across Zimbabwe during the last century [27]. There have been increased number of years with below normal rainfall since 1980 and increases in the intensity of mid-season dry spells and/or droughts occurring back to back in the same season (MSD, 2016). In the past, rains generally began in October/early November and ended in April/early May, however, most parts of the country are now only receiving rains as late 18 December [4]. Temperature data, show that there are more hot and fewer cold days than before [28, 29]. While, the country's mean ambient surface temperature since 1933 has shown a net warming of +0.3°C to 0.6°C [30]. These changes have an impact on cropping seasons and hence food security and nutrition.

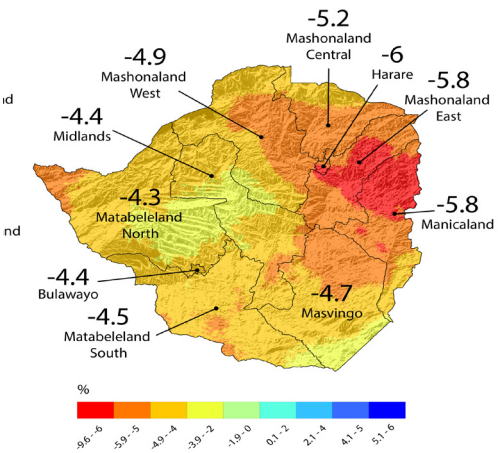
Projections up to 2070 indicate that average temperatures are expected to increase by up to 2.5 percent, while rainfall is expected to decrease by up to 5.9 percent. As such, Zimbabwe may become both hotter and drier, with huge implications for agricultural production. The south-western parts of the country are expected to experience the greatest increases in temperature of up to 2.2°C increase, while rainfall is expected to decrease most in the central-eastern parts of the country including parts of Mashonaland Central, Mashonaland East, Manicaland and Masvingo Provinces [31, 32, 33].

Projected change in Temperature and Precipitation in Zimbabwe by 2050 [31, 32, 33]

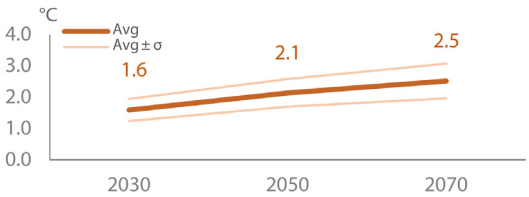
Changes in annual mean temperature (°C)



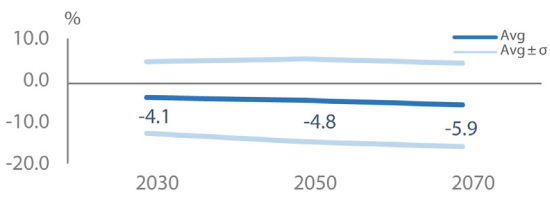
Changes in total precipitation (%)



Average temperature (°C)



Average precipitation (%)



9 The current UNDP 2017 National Human Development Report for Zimbabwe has a special focus on issues pertaining to climate change; hence its theme is Climate Change and Human Development: Towards Building a Climate Resilient Nation. This is because the Government of Zimbabwe regards climate change as a challenge which has the potential to undermine many of the positive achievements made in meeting the country's development goals.

The International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) was used to further analyze the effects of climate change on agriculture in Zimbabwe over the period 2020-2050[10] [34]. This assessment considered three parameters, namely net trade[11], crop area (or livestock numbers), and yields[12], for scenarios with and without climate change (CC and NoCC).

Independent of climate change, results suggest that Zimbabwe may become more dependent on imports of some food commodities. The country is expected to continue to be a net importer of groundnuts, potato, sorghum and soybean. For sorghum, net exports are expected to be greater under the climate change scenario than under the NoCC scenario by 32.4 percentage points[13] (pp). However, for potato, groundnuts and soybean net exports are expected to be less under climate change by 6.2pp, 35.7pp and 2.1pp respectively compared to the NoCC scenario.

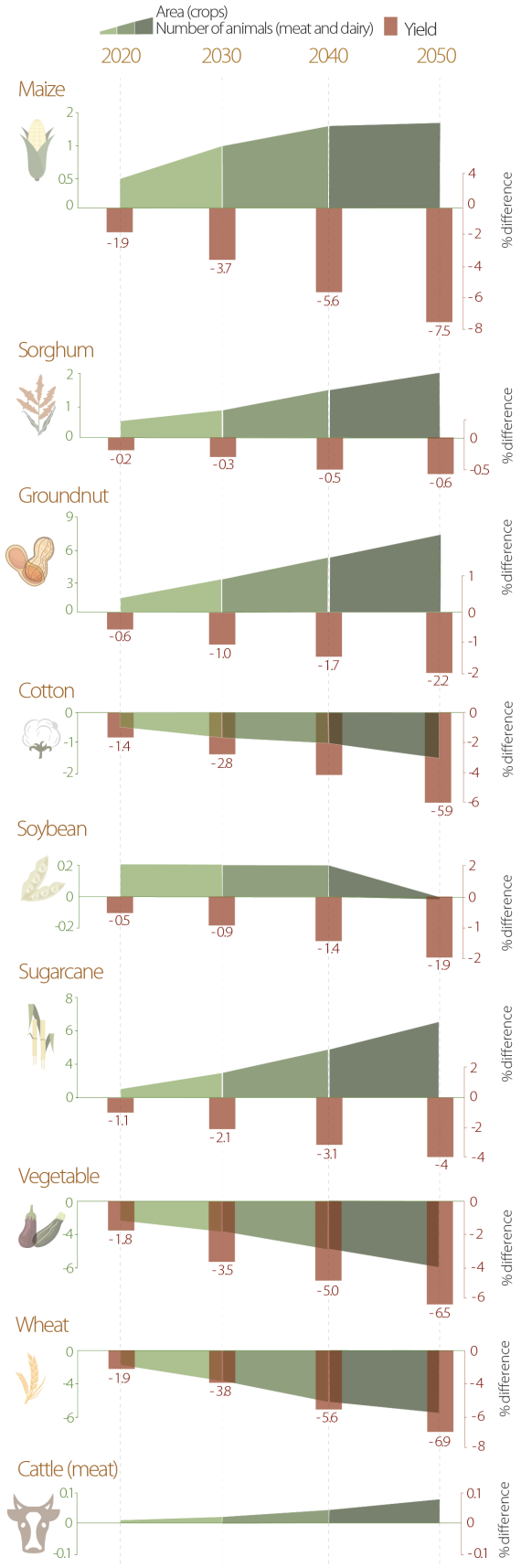
Projections also indicate that by 2050 the country could transition to be a net exporter of maize. Cotton is also expected to experience positive net trade during the period while wheat may transition from having a negative net trade to a positive net trade, with climate change resulting in a 50pp increase in net exports of the crop.

Ultimately, changes in demand of the commodities indicated above may be driven by several factors including population growth, national economic growth, incomes of individuals, commodity prices present in the global and national marketplace, consumer preferences, and national and international trade regulations.

The impact of climate change on area cultivated by 2050 indicates the following:

- The area under soybean and potato cultivation is projected to decrease under both scenarios; with the decrease being more pronounced under CC by 0.2 pp and 8.8pp respectively.
- The areas under maize, groundnut, sorghum and sugarcane cultivation are projected to increase under both scenarios; this increase being more pronounced under CC by 1.5pp, 6.7pp, 2.1pp and 6.9pp respectively.
- For cotton, wheat and vegetables, while the area under cultivation is projected to increase, under the CC scenario the increase can be expected to be less by 1.4pp, 6.8pp and 4.5pp respectively.

Climate change impacts on yield, crop area and livestock numbers in Zimbabwe



*A negative value denotes potential decreases in area and yield expressed as percentage change in a climate change scenario vs. non climate change

10 The IMPACT Model was parameterized by the Second Shared Socioeconomic Pathway (SSP2), a conservative scenario that is typically considered "business-as-usual".

11 A positive value for net trade indicates greater exports than imports while a negative value for net trade indicates greater imports than exports. Ideally countries strive to have positive net trade of key agricultural commodities.

12 Measured in tonnes/ ha

13 Percentage points being the difference between percentage changes for the climate change scenario and the no climate change scenario.

In terms of crop yields, results indicate that by 2050 the following could occur:

- Yield for all crops, with the exception of potato, are projected to increase under both scenarios.
- Under CC, the yields for maize, cotton and potato, are projected to be 7.5pp, 5.9pp and 26.1pp less, respectively, than under the NoCC scenario.
- The yields of vegetables, wheat, sugarcane , groundnuts and soya bean are expected to be 6.5pp, 6.9pp, 4pp, 2.2pp and 1.9pp less, respectively, under the CC scenario.

Cattle numbers and yields are not expected to vary greatly regardless of the scenario, although actual cattle numbers are expected to increase by approximately 27% under both scenarios, with an impact on livestock related GHG emissions. A key issue is the possible shift from staple food crops such as maize to cash crops such as tobacco which may provide better costs-benefit ratio in the future. All production systems in the country are projected to be somewhat affected by climate change.

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 productivity as well as contributing to at least one of the other objectives of CSA (adaptation and/or mitigation).

Conservation Agriculture[15] (CA) is the most widely practiced CSA activity in the country. The government along with various stakeholders have worked together to promote this farming practice primarily among smallholder communal farmers, mostly in the drier agro-ecological region IV and V. It was estimated that by 2010, 125,000 ha were under CA, with almost 100,000 smallholders involved in CA [35]. A key driver for adoption of CA was the provision of training and free (or subsidized) inputs. For example, programmes like the European Union and DFID funded Protracted Relief Programme (PRP) targeted almost 130,000 farmers for CA training and support [39]. Sustained adoption of CA is however limited by the availability of labor-saving technologies for planting and weeding, although labor saving machinery such as ox-drawn rippers and two wheel tractor based direct seeders have been tested. Additionally, due to limited grazing land in many communal areas, crop residues (required for mulching under CA) are prioritized for animal feed.

Agroforestry for both crop and livestock enterprises in the smallholder farming sector has been promoted across the country. Various national research stations are propagating seedlings for agroforestry particularly from the African acacia species (Acacia Albida) [35].

In the livestock sector provision of good quality feed, to reduce methane emissions, compared to dry and non-nutritious veld feed [35], while water harvesting and manure management including biogas production are important CSA practices. A challenge for some manure based technologies and practices include difficulty in manure collection and limited amounts of manure. Rearing of small ruminants (goats, sheep), particularly in regions IV and V, is also promoted as they are more robust to adverse weather and emit less emissions compared to cattle. Use of improved breeds and improved livestock health management can also contribute to resilience and improved efficiency in the sector.

Broader CSA practices in the country incorporate research, development, advocacy and training involving germplasm selection (i.e. breeding, introduction and seed multiplication of drought tolerant crops and animals), diversification of crop and animal production, and promotion of organic farming [35]. Water harvesting and efficient irrigation (particularly drip) are key adaptation practices for a variety of crops, especially for winter crops, fruits and vegetables which can also have an impact on incomes and nutrition. Soil management based practices such as precise fertilizer application, microdosing, manure application, agroforestry, crop rotations and intercropping, along with soil conservation structures (e.g. check dams) are practiced within the broader watershed management framework and are critical in enhancing and maintaining soil health.

Off-farm services for climate-smart agriculture include weather index-based crop and livestock insurance as well as climate information services for smallholder farmers. For example, the Ecofarmer program provides micro-insurance to smallholders to insure inputs and crops against drought or excessive rainfall, while also providing market and weather information to participating farmers who pay for the services using their prepaid mobile phone sim-cards.

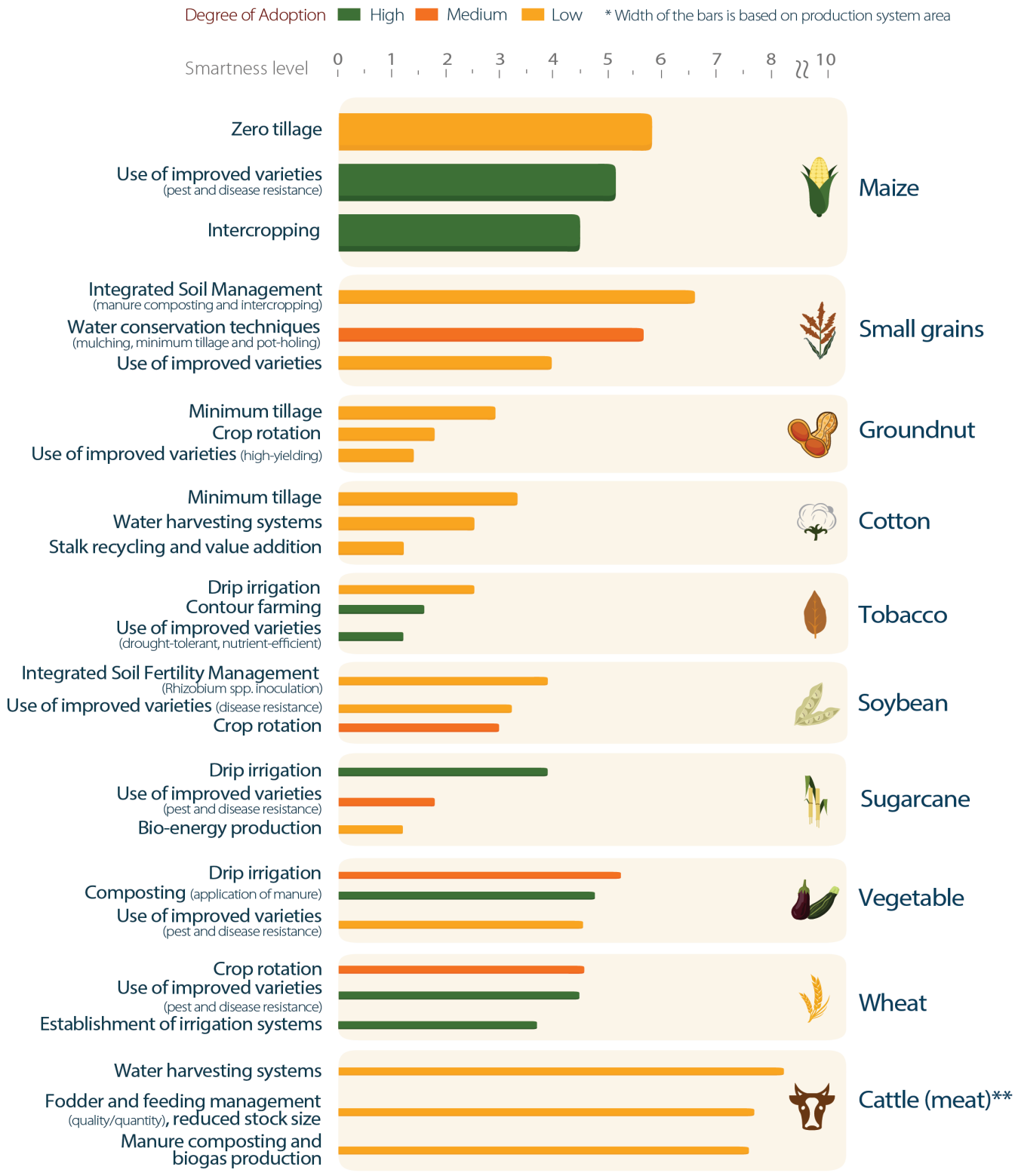
In terms of adoption drivers and incentives; access to information (including a well-trained extension system), finance for smallholder investments in CSA equipment, availability of output markets (for example for intercropped legumes) and availability of inputs (including labor saving technologies) on the local market would play an important role in encouraging sustained adoption of the CSA technologies and practices indicated above.

The following graphics present a selection of CSA practices with high climate-smartness scores according to expert evaluations. The average climate smartness score is calculated based on the practice's individual scores on eight climate smartness dimensions that relate to the CSA pillars: yield (productivity); income, water, soil, risks (adaptation); energy, carbon and nitrogen (mitigation). A practice can have a negative, positive or zero impact on a selected CSA indicator, with ±10 indicating a 100% change (positive/negative) and 0 indicating no change. Practices in the graphics have been selected for each production system key for food security identified in the study. A detailed explanation of the methodology can be found in Annex 2.

14 Noting that sugarcane is largely irrigated and climate change impacts may not be so relevant.

15 CA has three principles namely: crop rotations and associations, minimum soil disturbance and permanent soil cover.

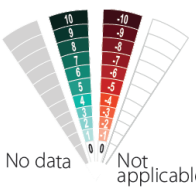
Selected CSA practices and technologies for production systems key for food security in Zimbabwe



** Unidentified production system area

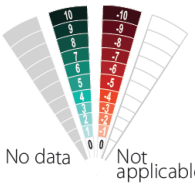
Table 1. Detailed smartness assessment for top ongoing CSA practices by production system as implemented in Zimbabwe.

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
Maize (51% of total harvested area)				
Zero tillage	Gwanda, Zaka <30%	S		**Productivity** Increases soil moisture due to the mulch layer and conservation of soil structure. Reduces soil erosion. **Adaptation** Conserves soil structure and in-situ moisture. Minimizes erosion and nutrient losses through leaching. **Mitigation** Maintains or improves soil carbon stocks and organic matter content. Reduces GHG emissions attributed to ploughing and the use of fossil fuels.
	Mazowe 30-60%	S		
Use of improved varieties (pest and disease resistance)	Gwanda, Zaka 60%	S		**Productivity** Potential increases in profits due to increased crop yield and quality. Increases food availability and access. **Adaptation** Increases farmers' capacity to limit the crop exposure to crop damage caused by pests and diseases. **Mitigation** Reduces use of synthetic pesticides and fungicides, thus reducing related GHG emissions.
	Mazowe 60%			
Small grains (e.g. Sorghum) (10% of total harvested area)				
Integrated soil management (manure composting and intercropping)	Natural regions 3, 4 and 5: Masvingo, Matebeleland North and South <30%	M		**Productivity** Increases the yield as a result of enhanced soil health and fertility. Reduces use of external inputs hence reducing production costs. Increases in income through high quality and healthy produce. **Adaptation** Enhances soil health, water retention, dynamic functions of soil's biology and long-term fertility. Minimizes soil erosion and enhances in-situ moisture. **Mitigation** Reduces use of nitrogen-based synthetic fertilizer, thus reducing related GHG emissions. Minimizes methane emissions upon proper aerobic composting.
	Natural regions 3, 4 and 5: Masvingo, Matebeleland North and South <30%	M		



Yield Income Water Soil Risk/Information Energy CO_2 Carbon N_2O Nutrient

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
Small grains(e.g. Sorghum) (10% of total harvested area)				
Water conservation techniques (mulching, minimum tillage and pot-holing)	Natural regions 3, 4 and 5: Masvingo, Matebeleland North and South 30-60%	S		**Productivity** Increases production per unit area and income through greater product quality. **Adaptation** Enhances soil bio-chemical and physical characteristics, hence improves water retention and long-term fertility. Enhances resilience to dry spells. **Mitigation** Reduces use of synthetic fertilizer per unit of output, thus reducing related GHG emissions. Maintains and/or improves soil carbon stocks and soil organic matter.
	Natural regions 3, 4 and 5: Masvingo, Matebeleland North and South 30-60%	S		
Groundnut (8% of total harvested area)				
Minimum tillage	Region 4 and 5: Bikita, Chivi 30-60%	S M		**Productivity** Increases yield due to enhanced soil health and fertility. Improves household nutrition. Reduces production costs. **Adaptation** Promotes soil structure conservation. Minimizes erosion and enhances in-situ moisture and water infiltration. **Mitigation** Reduces energy consumption for tillage. Maintains or improves soil carbon stocks and organic matter content.
	Region 3: Guruve, Gokwe South <30%	S M		
Crop rotation	Region 4 and 5: Bikita, Chivi <30%	M		**Productivity** Enhances production per unit area. Diversifies income and food sources. Allows constant production throughout the year. **Adaptation** Reduces soil erosion. Increases water and nutrient use efficiency per unit of output. **Mitigation** Intercropping with leguminous crops increases the efficient use of nitrogen-based fertilizers, and reduces related nitrous oxide emissions. Enhances above- and below-ground carbon sinks.
	Region 3: Guruve, Gokwe South 30-60%	M		

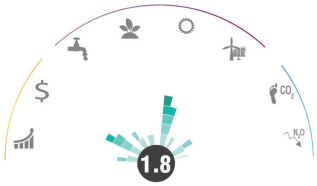
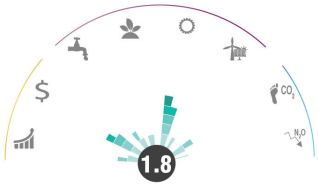


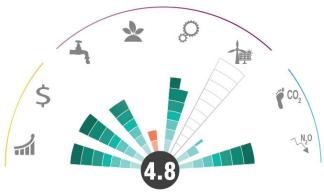
Yield Income Water Soil Risk/Information Energy CO_2 Carbon N_2O Nutrient

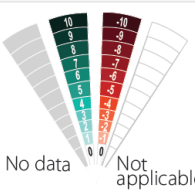
CSA practice	Region and adoption rate (%) <30 30-60 60>	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars
Cotton (7% of total harvested area)				
Minimum tillage	Region 5: Chiredzi, Chisumbanje, Mlipati <30%	S		**Productivity** Increases the yield hence farmer's income. Reduces use of external inputs. Increases food availability. **Adaptation** Promotes soil structure and fertility conservation. Conserves soil biodiversity. Reduces soil loss due to reduced soil disturbance. **Mitigation** Maintains or improves soil carbon stocks and organic matter content. Reduces GHG emissions attributed to ploughing and use of fossil fuels.
	Region 4 (Midlands): Gokwe <30%	S		
Water harvesting systems	Region 5: Chiredzi, Chisumbanje, Mlipati <30%	S		**Productivity** Increments in yield due to the higher number of tillers and better grain quality. **Adaptation** Enables larger area for cultivation even with limited water availability. **Mitigation** Reduced methane emission from rice field. Minimizes water use hence increase water use efficiency for rice cultivation.
	Region 4 (Midlands): Gokwe <30%	S		
Tobacco (3% of total harvested area)				
Drip irrigation	Natural region 3; Chikomba District, Masvingo, Churumhanzu <30%	L		**Productivity** Increases yield and quality of produce. Allows constant production throughout the year. Reduces labor requirement. **Adaptation** Increases farmers' capacity to limit the crop exposure to climate risks. Reduces soil erosion. Increases water and nutrient use efficiency per unit of output. **Mitigation** Integrated with ferti-irrigation increases the efficient use of fertilizers. Greater efficiency compared to other irrigation techniques.
	Natural region 2; Hurungwe District, Zvimba District, Goromonzi, Seke, Marondera, Chegutu <30%	L		

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
Tobacco (3% of total harvested area)				
Contour farming	Natural region 3; Chikomba District, Masvingo, Churumhanzu **60%**			**Productivity** Increases productivity per unit area due to medium- to long-term reconstitution of soil fertilit. **Adaptation** Promotes improved soil bio-chemical and physical characteristics. Allows agriculture in rugged landscapes. Reduces runoff and erosion, enhances in-situ moisture conservation (water infiltration). **Mitigation** Improves below-ground carbon sinks and soil organic matter content.
	Natural region 2; Hurungwe District, Zvimba District, Goromonzi, Seke, Marongera, Chegutu **60%**			
Soybean (2% of total harvested area)				
Integrated Soil Fertility Management (Rhizobium spp. inoculation)	Region 4 **<30%**	S M		**Productivity** Increases yields due to fertility restoration. Diversification of farm incomes. Reduces production costs. **Adaptation** Reduces environmental pollution. Increases biodiversity in the soil as well as on the farm. Reduces transmission of diseases (e.g. rust) and breaks down pest cycles. **Mitigation** Reduces the need for nitrogen fertilizer application when inoculants are introduced. Reduces the need for synthetic agrochemicals.
	Region 3 **30-60%**	M L		
Use of improved varieties (disease resistance)	Region 4 **<30%**	S M		**Productivity** Potential increases in crop yield and quality, hence greater farmer profits. Increases food availability and access. **Adaptation** Increases farmers' capacity to limit the crop exposure to damage caused by pests and diseases. **Mitigation** Reduces use of synthetic pesticides and fungicides, thus reducing related GHG emissions and carbon footprint.
	Region 3 **60%**	L		

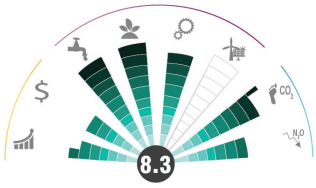
Yield Income Water Soil Risk/Information Energy CO_2 Carbon N_2O Nutrient

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
Sugarcane (1.5% of total harvested area)				
Drip irrigation	Natural region 4 and 5 <30%	S		**Productivity** Increases yield per unit area. Allows constant production throughout the year. **Adaptation** Enhances efficient use of water per unit of produce. Minimizes erosion and enhances in-situ moisture. **Mitigation** Greater efficiency than other forms of irrigation, hence reduced emissions per unit of produce.
	Natural region 4 and 5 (low land); Chiredzi, Mwenezi, Chisumbanje <30%	S		
Use of improved varieties (pest and disease resistance)	Natural region 4 and 5 60%			**Productivity** Increases productivity and income through greater product quality. **Adaptation** Increases farmers' capacity to limit the crop exposure to crop damage caused by pests and diseases. **Mitigation** Greater efficiency than other forms of irrigation, hence reduced emissions per unit of produce.
	Natural region 4 and 5 (low land); Chiredzi, Mwenezi, Chisumbanje 60%			
Vegetables (1% of total harvested area)				
Drip irrigation	Natural region 4 and 5; Masvingo, Matabeleland North, Matabeleland South, some parts of Midlands and part of Manicaland <30%	S		**Productivity** Increases productivity and income through greater product quality. **Adaptation** Increases farmers' capacity to limit the crop exposure to crop damage caused by pests and diseases. **Mitigation** Greater efficiency than other forms of irrigation, hence reduced emissions per unit of produce.
	Natural region 1 and 2; Manicaland (Parts of Mash west, part of Mash Central and parts of Midlands <30%	M L		

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
Vegetables (1% of total harvested area)				
Composting (application of manure)	Natural region 4 and 5; Masvingo, Matabeleland North, Matabeleland South, some parts of Midlands and part of Manicaland **60%**	S M		**Productivity** Increases productivity and income through greater product quality with minimal impact on the environment. **Adaptation** Enhances soil biodiversity, as well as chemical and physical characteristics. Promotes efficient use of local inputs. Reduces runoff and erosion. Increases soil water retention capacity. **Mitigation** Maintains or improves soil carbon stocks and organic matter content. Long-term reduction in nitrogen-based fertilizers and related GHG emissions.
	Natural region 1 and 2; Manicaland (Parts of Mash west, part of Mash Central and parts of Midlands **60%**	S M		
Wheat (0.5% of total harvested area)				
Integrated Soil Fertility Management (Rhizobium spp. inoculation)	Masvingo-Chiredzi, Chisumbanje, Gutu, Zaka, Midlands-Mvuma **30-60%**	S M		**Productivity** Increases total production and productivity per unit area. Multiple crop harvesting increases income and food security. Allows constant production throughout the year. **Adaptation** Crop diversification reduces the risk of total crop failure under unfavorable biotic and climatic conditions. **Mitigation** Introduction of leguminous crops reduces dependence on nitrogen-based fertilizers, and reduces related nitrous oxide emissions. Maintains or improves above- and below-ground carbon stocks.
	Mashonaland (central, west, east), Manicaland **30-60%**	S M		
Use of improved varieties (pest and disease resistance)	Masvingo-Chiredzi, Chisumbanje, Gutu, Zaka, Midlands-Mvuma **60%**			**Productivity** Increases crop production and quality, hence increases in income. **Adaptation** Reduces vulnerability to crop losses caused by pests and diseases. **Mitigation** Reduces use of synthetic pesticides thus reducing related GHG emissions and carbon footprint.
	Mashonaland (central, west, east), Manicaland **60%**			



Yield Income Water Soil Risk/Information Energy CO_2 Carbon N_2O Nutrient

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
Cattle (meat) (NA)				
Water harvesting systems	Regions 4 and 5: Masvingo, midlands, Matebeleland <30%	S M		**Productivity** Increases total production. Allows rearing of different livestock species and crops expanding the sources of income and food security. **Adaptation** Improves water availability enabling stable production during the dry season or during droughts. **Mitigation** Promotes indirect reductions of GHG emissions per unit of output in the medium- and long-term.
	Regions 4 and 5: Masvingo, midlands, Matebeleland <30%	S M		
Fodder and feeding management (quality/ quantity, reduced stock size	Regions 4 and 5: Masvingo, midlands, Matebeleland <30%			**Productivity** Reduces costs of production through reduction in external feed use. Increases animal yield and income through high quality food. **Adaptation** Provides alternative food source, decreasing vulnerability to drought and feed scarcity for animal production. **Mitigation** Reduces GHG emissions (carbon footprint) by reducing consumption of mass produced feeds. High-quality feed reduces methane emissions from ruminants.
	Regions 4 and 5: Masvingo, midlands, Matebeleland <30%			

Institutions and policies for CSA

There are several institutions that carry out CSA-related activities in Zimbabwe, ranging from government and non-government actors to United Nations agencies (UN), the private sector, academic institutions and farmer organizations. Their CSA work primarily focuses on information sharing and extension, provision of non-financial incentives, awareness raising, technical support to implement various CSA practices, input support, research and advocacy.

The Ministry of Agriculture, Mechanization and Irrigation Development[16] (MAMID) plays a critical role in coordinating all agricultural adaptation and mitigation related projects, and organizations working on CSA. The Department of Agricultural, Technical and Extension Services (AGRITEX) is the key institution working directly with farmers to promote and provide support for the adoption of CSA practices, particularly in capacity building related to conservation agriculture. MAMID and the Ministry of Education, in partnership with Green Impact Trust have recently developed a Climate-Smart Agriculture Manual for the country. MAMID has also developed a conservation agriculture strategy that guides the implementation of CSA activities.

The Climate Change Management Department (CCMD) of the Ministry of Environment, Water and Climate is responsible for policy work related to climate change and is also the GEF and UNFCCC focal point as well as being the GCF nationally designated authority (NDA), hence making the Ministry crucial for the development and implementation of any CSA related initiatives. The Meteorological Services Department (ZMD) plays an important role in provision of weather and climate information to farmers.

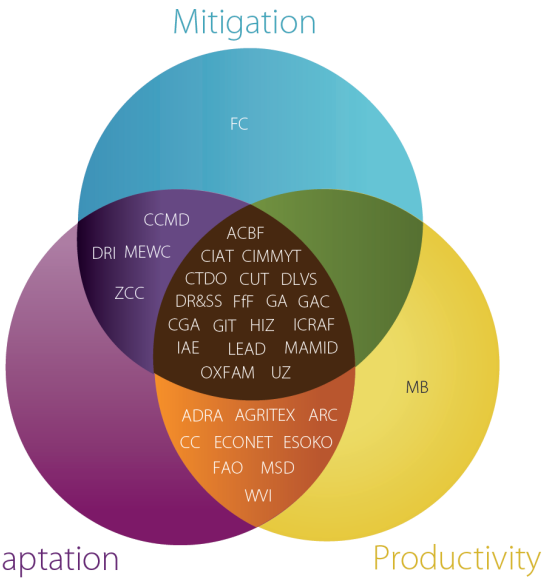
In terms of research, The Department of Research and Specialist Services (DRSS) is the main government research department involved in CSA. Working together with the Crop Breeding Institute (CBI), DRSS has offered training in crop-breeding to farmers. Through their work, drought-tolerant Open Pollinated Varieties[17] (OPVs) are now found on the market. These seeds are distributed by private companies such as Champion, Agricultural and Rural Development Authority (ARDA) and Agriseeds. Universities such as the University of Zimbabwe (UZ) and Chinhoyi University of Technology (CUT) also conduct CSA relate research for example on issues related to soil fertility management. Other research actors included CGIAR centers such as the International Maize and Wheat Improvement Center (CIMMYT) who have been largely focusing on the development of drought-tolerant maize varieties, but also on issues related to the mechanization and scaling up of CA.

International organizations such as the Food and Agriculture Organization (FAO) and the United Nations Development Program (UNDP) support government initiatives to build necessary policies and frameworks for CSA and an enabling environment for CSA activities, investments and implementation.

Zimbabwe has an active civil society involved in climate-smart agriculture related activities, including advocacy work through the Climate Change Working Group (CCWG[18]). These include organizations such as Oxfam, Practical Action and World Vision among others. In terms of work on the ground, their interventions primarily focus on adaptation; necessitated by the fact that they largely work in the most vulnerable regions of the country (Regions III, IV and V).

A number of private companies, including ZimPlow/ Mealie Brand, HASST Zimbabwe and GROWNET, manufacture CA

Institutions for CSA in Zimbabwe



ACBF African Capacity Building Foundation **ADRA** Adventist Development and Relief Agency **AGRITEX** Department of Agriculture, Technical and Extension Services **ARC** Agricultural Research Council **CC** Christian Care **CCMD** Climate Change Management Department **CGA** Carbon Green Africa **CIAT** International Center for Tropical Agriculture **CIMMYT** International Maize and Wheat Improvement Center **CUT** Chinhoyi University of Technology **DLVS** Department of Livestock and Veterinary Services **DRI** Development Reality Institute **DR&SS** Department of Research and Specialist Services **ECONET** Econet Zimbabwe **FAO** Food and Agriculture Organization of The United Nations **FC** Forestry Commission **FfF** Foundations for Farming **GA** Genesis Analytics **GAC** Gwebi Agricultural College **GIT** Green Impact Trust **HIZ** Heifer International Zimbabwe **IAE** Institute of Agricultural Engineering **ICRAF** World Agroforestry Centre **ICRISAT** International Crops Research Institute for the Semi-Arid Tropics **LEAD** LEAD Trust **MAMID** Ministry of Agriculture, Mechanization and Irrigation Development **MB** Mealie Brand **MEWC** Ministry of Environment, Water and Climate **MSD** Meteorological Services Department **UZ** University of Zimbabwe **ZCC** Zimbabwe Council of Churches **WVI** World Vision International

16 Now known as the Ministry of Lands, Agriculture and Rural Resettlement (MLARR)

17 The drought tolerant OPVs include ZM309, ZM401 and ZM521 while hybrids developed include ZS263 and ZS265

18 A grouping of over 25 civil society organizations conducting work on climate change

equipment such as jab planters, rippers, and direct seeders. Econet Wireless through their Ecofarmer program[19] supports smallholder farmers with insurance, weather information and agricultural advice. More could be done to engage the youth in CA equipment manufacture and repair as well as to engage private sector in CSA related finance and contract growing of CSA related crops and legumes.

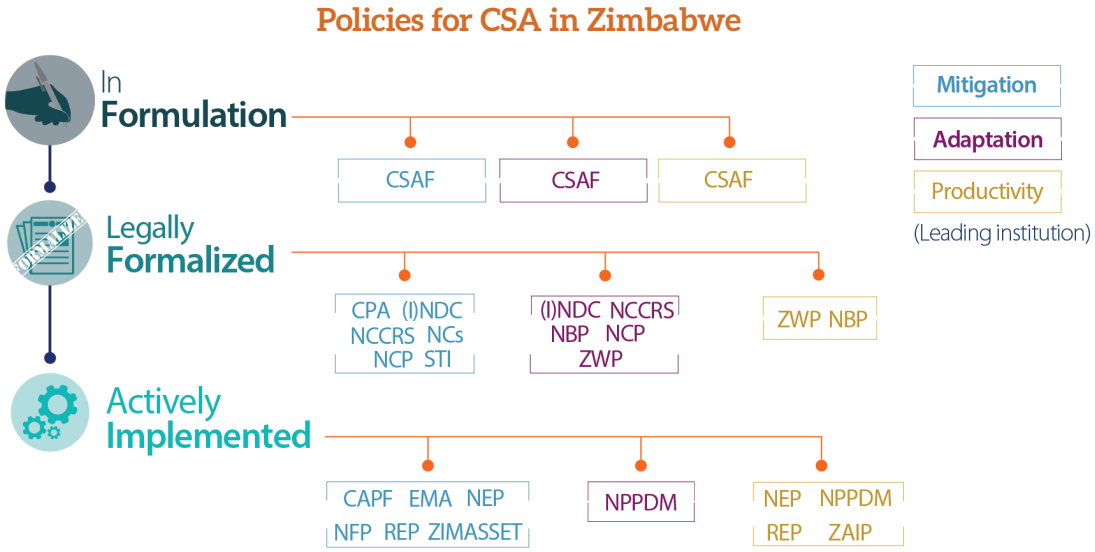
Faith-based organizations such as Foundations for Farming, The Zimbabwe Council of Churches and River of Life promote CSA practices, particularly conservation agriculture, through training and establishment of demonstrations.

Although there is a National Domestic Biogas Programme[20] and work related to renewable energy for agricultural production and processing[21], there is still a gap around the mitigation pillar, with most organizations focusing on adaptation and productivity. The limitations to mitigation activities include lack of funding and lack of proper knowledge around this pillar.

Overall, some of the key challenges noted by the CCWG related to implementation of agricultural adaptation and mitigation initiatives, was weak institutional capacity, donor fatigue (as the same donors are approached for funding) and limited public-private sector support [28]. Additionally, there is lack of coordination among stakeholders, which often results in a duplication of climate-related projects, hence the focus on adaptation activities and targeting of projects in the same geographic area [28].
The previous graphic highlights key institutions whose main activities relate to one, two or three CSA pillars (adaptation, productivity and mitigation). More information on the methodology is available in Annex 3.

Climate policy is formulated and implemented under the CCMD of MEWC. The National Climate Change Response Strategy (NCCRS, 2015) provides a framework for adaptation, mitigation, technology, financing as well as public education and awareness on climate change. The strategy identifies drought and stress tolerant varieties, post-harvest management, improved livestock breeds, integrated water resources management and efficient energy among other agricultural CSA-related priorities. Climate information and research are also emphasized as key enabling services for agriculture. The Zimbabwe Climate Policy (2017) focuses on mainstreaming climate issues in all sectors of the economy including agriculture and forestry.

Zimbabwe's NDC highlights agriculture as a focus area for adaptation and mentions the need for climate-smart agriculture practices, specifically conservation agriculture; use of drought tolerant varieties and breeds; agroforestry; water harvesting and efficient irrigation; as well as support services, such as climate information, and weather index based crop and livestock insurance. The NDC indicates that approximately USD 56 billion is required for achieving Zimbabwe's mitigation goals, with USD 1 billion each



CAPF Comphrensive Agriculture Policy Framework (2012) (MoAMID) **CPA** The Civil Protection Act (1989) (MLGUD) **CSAF** Climate-Smart Agriculture Framework (2017) (MOAMID) **EMA** Environmental Management Act (2005) (EMA) **(I)NDC** (Intended) Nationally Determined Contribution (2015) (MEWC) **NBP** National BioFuels Policy (2015) (MEPD) **NCCRS** National Climate Change Response Strategy (2013) (MEWC) **NCs** National Communications to the UNFCCC (2012) (MEWC) **NCP** National Climate Policy (2016) (MEWC) **NEP** National Energy Policy (2012) (MEPD) **NFP** The Forest Policy (2014) (MEWC) **NPPDM** The National Policy and Programme on Drought Mitigation (2005) (MoAMID) **REP** The Renewable Energy Policy (2017) (MEPD) **STI** The Second Science, Technology and Innovation Policy (2012) (MSTD) **ZAIP** Zimbabwe Agriculture Investment Plan (2013) (ZAIP) **ZIMASSET** Zimbabwe Agenda for Socio-Economic Transformation (2013) (GoE) **ZWP** Zimbabwe Water Policy (2012) (MWRDM)

19 https://www.econet.co.zw/ecofarmer
20 http://www.snv.org/project/national-domestic-biogas-programme-zimbabwe
21 https://practicalaction.org/rused-himalaya

required for REDD+ activities and sustainable energy for tobacco curing, and a further USD 100 million required for ethanol production from sugarcane [3].

Zimbabwe's agriculture sector is guided by the Comprehensive Agricultural Policy Framework (2015-2035) which is operationalized partly through the Conservation Agriculture Strategy. This policy recognizes the country's susceptibility to droughts and highlights expansion of irrigation in the smallholder sector, construction of dams, and efficient use of water. The Zimbabwe Agriculture Investment Plan (2013) specifically mentions climate-smart agriculture including practices such as tree planting, conservation agriculture, water harvesting, irrigation, and multiplication and use of drought resistant varieties among other CSA related practices. There is an agriculture policy that is currently under review, which will need to be screened to ensure it adequately integrates CSA issues. A seed policy is also being developed that takes into account the need for drought tolerant seed varieties and recognizes the rights of SHFs to save, use and exchange indigenous seed to boost yields. A significant development towards scaling up of CSA practices is the Climate-Smart Agriculture Framework (CSAF) being developed jointly by MAMID and MWEC with support from the Vuna Project (though Genesis Analytics).

A Climate-Smart Agriculture Manual for Agriculture Education (2017) has been developed by the Climate Technology Centre and Network (CTCN) and the United Nations Environment Programme - Technical University of Denmark Partnership (UNEP-DTU). The manual is targeted at agricultural colleges and is expected to support the transformation of the country's agriculture sector into a sustainable production system by maximizing the climate opportunities and reducing climate change related risks in the agricultural sector.

The Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZimASSET), the country's overall long term economic development plan, includes strategies that promote the production of drought, heat tolerant, and high yielding crop varieties.

Overall, Zimbabwe has a broad CSA related policy environment, however the key challenge is insufficient funding and lack of human and institutional capacity to implement them.

The previous 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, see Annex 4.

Financing CSA

Financing is critical for incentivizing farmers and Zimbabwe spent USD 900 million for implementation of agricultural adaptation actions between 2010 and 2015 [27]. However, the actions required the NCCRS, are costed at USD 9.8 billion, with the agriculture sector requiring USD 2.3 billion for implementation of the proposed action plans and the water sector requiring USD 3.1 billion.

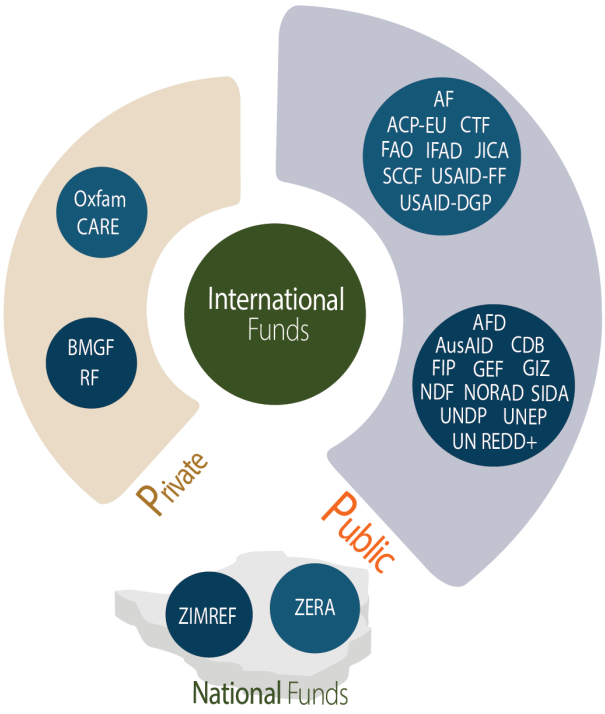
Financing for CSA projects is however, constrained by the limited availability of government funding toward agriculture and unsuitable environment for leveraging capital investments. The country faces challenges related to limited foreign direct investment (FDI) due to low investor confidence caused by political and policy uncertainties, and difficulties in resource mobilization.

The main sources for international climate financing for Zimbabwe include the GEF, UNDP and the USD 80 million Zimbabwe Resilience Building Fund managed by UNDP, which is a pool of funds from various partners including the Department for International Development (DFID), European Union (EU) and Swedish International Development Agency (SIDA) in partnership with the MAMID to build resilient livelihoods and wellbeing for individuals and communities.

Zimbabwe has accessed USD 56,000 for its readiness program to support institutional capacity building through the Green Climate Fund and this is expected to lead to mobilization of larger funds for implementation of projects on the ground. It will be important to ensure that some of the projects focus on agriculture. The country has also accessed funds for agricultural climate change adaptation projects from the Special Climate Change Fund (SCCF), focusing on climate information and support to smallholders to implement various climate-smart agriculture related practices (e.g. drought tolerant varieties and breeds, intercropping, water harvesting, small scale irrigation). Bilateral funding from organizations such as the Australian Agency for Development (AUSAID) and Nordic Development Fund are also used for climate change adaptation projects. In terms of mitigation, the Kariba REDD+ project implemented by Carbon Green Africa, is the largest such project by area and focuses on activities such as conservation agriculture, nutrition gardens, fire management, water harvesting and livelihoods diversification (e.g. beekeeping).

Most funding has been toward agricultural productivity and adaptation projects and there is a general lack of awareness of the diverse availability of international funding sources for climate change adaptation and mitigation. In addition, several stakeholders, especially from government and the NGO sector that undertake CSA-related activities lamented the lack of capacity to write bankable climate change adaptation and mitigation proposals for competitive international grants.

Financing opportunities for CSA in Zimbabwe



ACP-EU African, Caribbean and Pacific-European Union Energy Facility **AF** Adaptation Fund **AFD** French Development Agency **AusAID** Australian Agency for International Development **BMGF** Bill and Melinda Gates Foundation **CARE** Cooperative for Assistance and Relief Everywhere **CDB** China Development Bank **CTF** Clean Technology Fund **FAO** Food and Agriculture Organization of the United Nations **FIP** Forest Investment Program **GEF** Global Environment Facility **GIZ** German Society for International Cooperation **IFAD** International Fund for Agricultural Development **JICA** Japan International Cooperation Agency **NDF** Nordic Development Fund **NORAD** Norwegian Agency for Development and Cooperation **RF** Rockefeller Foundation **SCCF** Special Climate Change Fund **SIDA** Swedish International Development Cooperation Agency **UNDP** United Nations Development Programme **UNEP** United Nations Environmental Programme **UN REDD** United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation **USAID-DGP** United States Agency for International Development – Development Grants Program **USAID-FF** United States Agency for International Development – Feed the Future **ZERA** Zimbabwe Energy Regulatory Authority **ZIMREF** Zimbabwe Reconstruction Fund

At the national level, the Zimbabwe Agricultural Development Trust (ZADT), provides financial support for smallholder farming, using pooled resources from development partners such as DFID and The Ford Foundation. Through these funding sources, ZADT established the Credit for Agricultural Trade and Expansion (CREATE) Fund, which provides loans for agricultural value chain activities in partnership with local banks (for example EcoBank and Steward Bank). Criteria for funding involves green principles related to climate-smart and agro-ecological practices that include better management of crop and livestock production, soil conservation and water management. ZADT also has a micro-financing program administered through organizations such as Inclusive Microfinance. A notable shortfall of microfinancing in Zimbabwe are the high interest rates charged to borrowers, which can lead to marginal profits in farming, or sometimes debt. This is particularly concerning for CSA as in many cases investment in agricultural adaptation and mitigation may take a number of seasons to recoup.

Multi donor trust funds also exist, including the Zimbabwe Reconstruction Fund (ZimRef) and the African Development Bank (AfDB) administered Zimbabwe Multi Donor Trust Fund (ZimFund), of which The Swedish Government is a key donor. The Zimbabwe Climate Change Technical Assistance Program (ZIM-Clim), financed through a US$1.5 million grant from ZIMREF, aims to strengthen the Government of Zimbabwe's capacity to integrate climate change considerations into the planning, design and implementation of development activities in priority sectors, notably, agriculture and sustainable land management, forest landscapes and the energy/water nexus. Donors through ZimFund have contributed around US $145 million towards water and energy projects.

Potential Finance

In addition to various bilateral funding sources, climate financing opportunities exist through the African Union Extreme Climate Facility and the Green Climate Fund (GCF). The World Bank is providing technical support to assist the Infrastructure Development Bank of Zimbabwe (IDBZ) to become a GCF accredited entity (AE). Once formalized it is expected that the IDBZ will be able to fund and promote agriculture related climate change adaptation and mitigation projects. The Environmental Management Agency (EMA) is in the process of gaining accreditation to the Adaptation Fund and this could be another opportunity for accessing international climate finance for CSA related initiatives. The Extreme Climate Facility (XCF) is designed to enable African Union member states to access private capital through Climate Catastrophe Bonds, providing an opportunity for funding the country's CSA related activities.

Outlook

Zimbabwe has put in place various policies and strategies for implementation of agricultural climate change adaptation and mitigation practices and technologies. These include the NCCRS and the NDC as well as the soon to be finalized CSAF, while the country is currently developing its National Adaptation Plan. There is however need for education and capacity building across public, private and civil society stakeholders, as critical elements for enhancing adoption and implementation of agricultural climate change adaptation and mitigation initiatives in the country.

Conservation agriculture has been highly promoted across the country, however, sustained adoption is constrained by factors such as the increased drudgery associated with it and use of crop residues primarily as livestock feed rather than mulch. The constraints can be addressed through investment in improved CSA technologies, farmer sensitization and awareness raising particularly regarding the drudgery challenge are required.

Land degradation and natural resource management are major challenges, and locally appropriate climate-smart agriculture practices and investments are needed that improve the natural resource base. Soil based CSA practices could play a key role in ensuring food security in a declining natural resource base and a changing climate.
The NCCRS and NDC point to the energy sector as a crucial area for undertaking low carbon development. Agriculture on the other hand is largely targeted for adaptation actions. Upscaling green energy to support smallholder agricultural production, for example, promoting irrigation and agro-processing using renewable energy (micro/mini hydro projects, solar powered irrigation projects and biogas digesters) will be important to support the country's smallholders particularly those in off-grid locations.

It is anticipated that climate change and variability are likely to change land suitability for agricultural production across the country [36]. There is need for land suitability mapping and awareness raising amongst communities on locally appropriate climate-smart practices. More importantly is the need to update the country's agro-ecological zones. This is especially relevant given the potential changes that have occurred in the country's agroecological zones since they were first mapped in 1960.

Lastly, the need to mainstream CSA into agricultural investments in the country is crucial, and can be supported through the development of a national climate-smart investment plan (CSIP) or screening of Zimbabwe's Agriculture Investment Plan (ZAIP) for climate-smart agriculture opportunities. The revamping and capacity building of the agricultural extension and research related institutions so they have a better focus and capacity on CSA will also be important.

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For further information and online versions of the Annexes

Annex 1: Selection of agricultural production systems key for food security in Zimbabwe (methodology)
Annex 2: Methodology for assessing climate-smartness of ongoing practices
Annex 3: Institutions for CSA in Zimbabwe (methodology)
Annex 4: Assessing CSA finances in Zimbabwe (methodology)
Annex 5: Zimbabwe's Agroecological Zones

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