United Nations
Economic Commission for Africa

Working paper

Spatial implications of climate change on land allocation and agricultural production in the Economic Community of West African States

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DISCLAIMER

The present working paper was financed by the African Climate Policy Centre at the Economic Commission for Africa (ECA) and written by Boris Odilon Kounagbè Lokonon, Aklesso Egbendewe-Mondzozo, Naga Coulibaly and Calvin Atewamba for the United Nations University Institute for Natural Resources in Africa. It does not necessarily reflect the opinion of either the United Nations University Institute for Natural Resources in Africa or the African Climate Policy Centre.

ABBREVIATIONS AND ACRONYMS

ACZs	agro-climatic zones
ACSZ	agro-climatic and soil zones
AEZs	agro-ecological zones
ASM	agricultural sector model
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization
GDP	gross domestic product
GHG	greenhouse gas
GIS	geographic information system
GTAP	global trade analysis project
PMP	positive mathematical programming
RCM	regional climate model
RCPs	representative concentration pathways
SSPs	shared socioeconomic pathways
SWAP	statewide agricultural production model
TASM	Taiwan agricultural sector model
USD	United States dollars
WAEMU	West African Economic and Monetary Union
WDI	World Development Indicators

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EXECUTIVE SUMMARY

Climate change is acknowledged to be among the most serious threats to food supply systems and their capacity to meet the growing food needs of populations. Indeed, it is predicted that agriculture in the Economic Community of West African States (ECOWAS) countries will be seriously affected by climate change, but the magnitude and impact of that change will vary across landscapes. The present working paper looks at various agro-climatic zones (ACZs) and investigates the potential impact of climate change on land allocation and crop production in the ECOWAS region. The authors of the paper used a regional mathematical programming model to simulate the impact of climate change on crop acreage and crop production under two representative concentration pathways (RCPs) and four prevailing socioeconomic conditions. The findings suggest that crop acreage and production will decrease, increase or remain constant according to the type of crops cultivated and future climate and socioeconomic scenarios. The production of paddy rice, maize, sorghum, millet, oil seeds, cocoa, coffee and sesame is likely to fall in most areas as a result of both moderate and severe climate change. The magnitude and the direction of the change are expected to vary across different geographical areas. This paper, moreover, underscores the need for international action to reduce greenhouse gas emissions to ensure that populations in developing counties enjoy a higher quality of life in the years ahead, as well as the need for effective adaptation strategies to mitigate the negative effects of climate change.

1. INTRODUCTION

Climate change poses one of the most serious threats to food supply systems and their capacity to meet growing food needs (Leclère and others, 2014; Parry and others, 2004; von Lampe and others, 2014). It exacerbates other existing challenges, including extreme poverty and hunger (Nelson and others, 2010). Climate change is expected to hamper food production in the future, and may significantly impede the achievement of the 2030 Agenda for Sustainable Development. Indeed, climate change is recognized as a factor that is already depressing major crop productivity, and it is predicted to have a significant impact on the overall supply of agricultural products in the future (Gornall and others, 2010; Roudier and others, 2011; Di Falco and others, 2012; Challinor and others, 2014; Rosenzweig and others, 2014; Leclère and others, 2014; Intergovernmental Panel on Climate Change, 2014a, b).

Agriculture in developing countries is likely to be seriously affected by climate change (Tol, 2002; Fischer and others, 2005; Mendelsohn and others, 2006). Indeed, agricultural production in those countries is irrigated, primarily, by rain and is thus heavily dependent on climatic conditions. Opportunities exist, however, although revenue from African crops is likely to decline as temperatures rise, the net revenue from African livestock is, in many cases, likely to increase (Seo and Mendelsohn, 2008a, b; Seo and others, 2009).

Moreover, climate change is also expected to provide opportunities to improve established farming practices (Gornall and others, 2010), but Seo (2013) concluded that, although farmers can prepare for climate change, they are presently ill-equipped for sudden weather-related change. It is therefore critical to identify the most appropriate climate adaptation strategies for farmers.

Before considering those strategies, however, relevant stakeholders must assess the magnitude of the potential threats resulting from climate change. To that end, a variety of economic models have been developed to investigate the impact of climate change on agricultural production, including large-scale models (Butt and others, 2005; Medellin-Azuara and others, 2011; Leclère and others, 2014) to small-scale bioeconomic models (Pinky and Rayhan, 2013, Lokonon and others, 2015). In addition to impact evaluation, bioeconomic models are also used to conduct policy simulations, including agricultural and adaptation policy simulations (Barbier and Bergeron, 1999; Judez and others, 2001; Bartolini and others, 2007; Cortignani and Severini, 2009; Louhichi and others, 2010a; Janssen and others, 2010; Sanfo and Gérard, 2012; Louhichi and Paloma, 2014) and environmental policy simulations (Dolisca and others, 2008; Hellwinckel and others, 2010; Janssen and others, 2010; Louhichi and others, 2010b; Belhouchette and others, 2011; Egbendewe-Mondzozo and others, 2011; Bamière and others, 2011, Egbendewe-Mondzozo and others, 2013; Chen and others, 2014; Egbendewe-Mondzozo and others, 2015).

Although earlier studies have provided useful tools to measure the impact of climate change on agriculture at both a continental and national scale within Africa, the question of how that impact may vary across landscapes remains unresolved (Seo and others, 2009). The effects of climate change will differ across agro-ecological zones (AEZs) and agro-climatic zones (ACZs) in Africa (Seo and others, 2009; van Wart and others, 2013). The Food and Agriculture Organization of the United Nations (FAO) defines AEZs as geographic units that have a similar climate and soil for agriculture, while ACZs are defined as divisions of a region based on homogeneity in weather variables that have the greatest influence on crop growth and crop yield (van Wart and others, 2013).

In other words, while AEZs help broadly define environments where specific agricultural systems may prove successful, ACZs can be studied with a view to more effectively distinguishing between similar agricultural systems within the larger AEZs (van Wart and others, 2013). Given that soil characteristics are also important determinants in agricultural systems, agro-climatic and soil zones (ACSZs), represent an appropriate geographical unit that may be scaled up, in time and space. Within large ACZs, ACSZs represent similar agricultural systems, primarily in terms of the different soil types they contain.

This paper considers the implications of climate change in terms of land allocation and crop production across ECOWAS countries using data obtained from an ACSZ-based bioeconomic model. Specifically, the following research questions are addressed in this paper:

- What are the spatial implications of climate change on crop land allocation in ECOWAS countries?
- To what extent will crop production be affected by climate change in ECOWAS countries?

This paper incorporates socioeconomic and climatic scenarios into the regional bioeconomic model which provides a detailed overview of climate and soil types in West Africa – where there is often insufficient high-quality data. It is therefore possible to compare various geographic units in West Africa in terms of land allocation and agricultural production under different socioeconomic and climatic scenarios.

The remainder of the paper is organized as follows: the main components of the bioeconomic model are described in Section 2; the main results are presented in Section 3; and the paper concludes with a discussion of key findings as well as policy implications and suggestions for future research.

2. MATERIALS AND METHODS

1.1. STUDY AREA

The present study was conducted in the ECOWAS region in West Africa (see Figure). The region includes the following 15 countries: Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, the Niger, Nigeria, Senegal, Sierra Leone, Togo. However, Cabo Verde was not included in the present paper owing to insufficient data. The ECOWAS region covers 5.1 million square kilometres, and its population in 2014 was approximately 339,860,900. The livelihoods of the vast majority of people in West African countries depend on agriculture. However, although agriculture employs some 60 per cent of the region's labour force, it contributes only 35 per cent to its gross domestic product (GDP) (Jalloh and others, 2013). Farmers in ECOWAS countries produce at rates on par with subsistence levels of agriculture, due to the fact that many of them live in entrenched poverty and face numerous constraints on their agricultural productivity, including climate shocks, soil acidity, and nutrient-depleted and degraded soils that impede agricultural development. The most important food crops grown and consumed in ECOWAS countries include cereals (maize, sorghum, millet and rice), roots and tubers (cassava, sweet potatoes and yams), and legumes (cowpeas and groundnuts), while the major cash crops include cocoa, coffee and cotton (Jalloh and others, 2013). The region is divided into 39 ACZs (Sebastian, 2014). Soils are grouped into three types: loam, clear and sandy, to generate ACSZs for the modelling exercise (see Figure).

Figure I Maps of ACZs and soils in the ECOWAS region

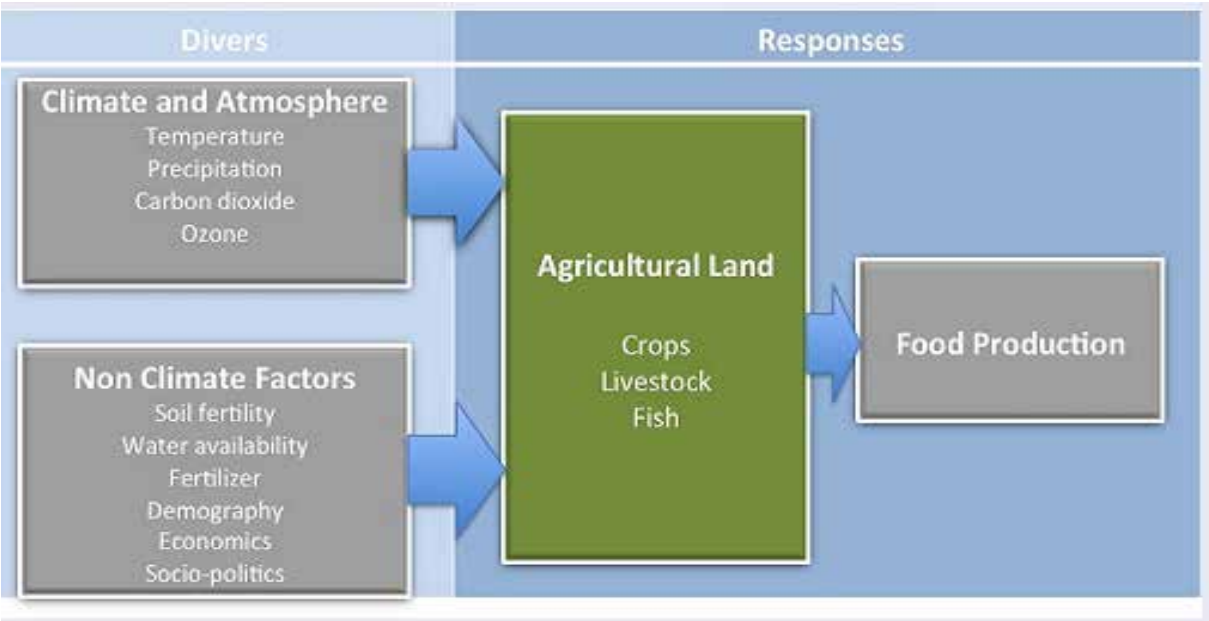
	
ACZs ***Source:*** *van Wart and others (2013)*	***Main*** *soil types* ***Source:*** *FAO (2015)*

1.2. MODEL

The research was carried out using a bioeconomic model with a representative risk-neutral and profit maximization economic agent. The model integrates a biophysical geographic information system (GIS) into a regional economic mathematical programming model (referred to as ECOLAND), which builds on previous regional bioeconomic models in a multi-product partial equilibrium framework (McCarl and Spreen, 1980; Chang, 2002; Spreen, 2006). Those previous models include, for example, the agricultural sector model (AMS) – a spatial mathematical programming model developed for the United States agricultural sector – which was used to simulate market equilibrium effects for resources (land, water and labour) and commodities (domestic use, imports and exports of primary and secondary or processed

items) (Attwood and others, 2000; Chang and others, 1992); the Taiwan agricultural sector model (TASM) – a price-endogenous spatial equilibrium model – which was used to assess the impact of crop yield changes in Taiwan Province of China on regional production, land use, welfare distribution, as well as the capacity of the agricultural sector in that region to adapt to climate change (Chang, 2002). Howitt and others (2009) and data derived using the statewide agricultural production model (SWAP), – a price-endogenous optimization model calibrated with the positive mathematical programming (PMP) approach used to estimate the revenue impact of climate change in California. ECOLAND is a strictly supply-oriented model that considers climate and atmosphere factors, such as temperature, precipitation and carbon dioxide levels, as well as non-climatic factors, such as soil fertility, demography and output prices, as exogenous variables (see Figure). Indeed, ECOLAND does not consider the relationship between price responses and induced supply changes. Crop yields are supplied to the bioeconomic model by an econometric crop simulator component. The GIS component supplies parameters relative to the ACSZs, including the size of areas dedicated to arable farming and to livestock farming.

Figure II ECOLAND conceptual framework



Source: *United Nations University Institute for Natural Resources in Africa (2014)*

1.2.1. CROP YIELD MODEL

Crop yields were generated using climate change outputs from two representative concentration pathways (RCPs). Following Chang (2002), the study adopted a multi-regression approach for crop yield generation. Average crop yields from the 39 ACZs and for the three types of soil in the ECOWAS region for the year 2004 were used in the econometric regressions. The econometric approach was adopted because the study was conducted with a view to estimating the values of the crop yields based only on changes on environmental conditions such as climate. Crop rotation and other management practices that may improve or worsen environmental factors, such as soil nutrient content, were not considered. The study assumed that crop yields depend primarily on climate and soil conditions, and atmospheric carbon dioxide concentrations.[1] Agriculture is primarily rain-fed in ECOWAS countries, and the use of advanced agricultural technologies and fertilizers is not widespread. However, after estimating crop

1 It is worth noting that, as this study does not follow the duality approach (Segerson and Dixon, 1999), prices are not included in the model.

yields in various environmental scenarios, results were adjusted to account for the impact of technological innovation. The model in its general form is presented as follows:

$$Y_{it} = Z_{it} CO2_t^{\delta} \left(\prod_{j=May}^{Oct} T_{ijt}^{\alpha_j}\right)\left(\prod_{j=May}^{Oct} P_{ijt}^{\beta_j}\right)\left(\prod_{k=1}^{9} S_{ik}^{\gamma_k}\right) \quad (1)$$

Or in logarithmic terms:

$$\log(Y_{it}) = \log(Z_{it}) + \sum_{j=May}^{Oct} \alpha_j \log(T_{ijt}) + \sum_{j=May}^{Oct} \beta_j \log(P_{ijt}) + \sum_{k=1}^{9} \gamma_k \log(S_{ik}) + \delta \log(CO2_t \quad (2)$$

where i and t are, respectively, the agro-climatic and soil zones index and time index, Z_{it} is technological progress, T_{ijt} is the monthly main temperature, P_{ijt} is the monthly main precipitation, S_{ik} is the soil characteristics, and $CO2_t$ is the concentration of carbon dioxide in the atmosphere at time t.

The dynamic of technological progress[2] is given by

$$\log(Z_{it}) = 0.06 * \left(\frac{t}{1+t}\right)^{60} + 0.98 * \log(Z_{it-1}) + U_{it}\ ;\ \ Z_{i0} = 1 \quad (3)$$

where U_{it} is a white noise with a truncated normal distribution $\aleph(0, 0.005, [0, +\infty[)$.[3]

1.2.2. GEOGRAPHIC INFORMATION SYSTEM COMPONENT OF THE BIOECONOMIC MODEL

In the design of a consolidated map of ACZs, soils, land uses, countries, river basins and river sub-basins, a geographic information system (GIS) was used. Agricultural production decisions take place at the ACZ level. However, country-level, basin-level and sub-basin level information with regard to the share of ACZs dedicated to agriculture are needed in order to aggregate agricultural land allocation and agricultural production at country, sub-basin and basin levels. Due to technical constraints, the study considered only the five major basins in the ECOWAS region, specifically: the Gambia, the Niger, Senegal, and Lake Chad and the Volta River.4 ACZ crop and livestock land information obtained from the land use map (Sebastian, 2014; FAO, 2015; van Wart, and others, 2013) was used to compute land use shares, which were used as aggregation coefficients for the modelling outputs.

1.2.3. ECONOMIC MATHEMATICAL PROGRAMMING MODEL

The present working paper assumed a farming system characterized by seven cropping systems and four livestock types. The cropping systems were paddy rice, cereals (maize, sorghum and millet), vegetable and fruits (bananas, cassava, plantains, potatoes, sweet potatoes and yams), oil seeds (beans, cashew nuts, cowpeas, groundnuts and soybeans), sugarcane, cotton and other crops (cocoa, coffee and sesame), as in the classification of crops according to the Global Trade Analysis Project (GTAP). The livestock types included cattle, sheep and chicken. The empirical model assumed that farmers must select from the portfolio of the seven cropping systems and the four livestock types by allocating land, labour and financial resources to maximize the discounted farm profit for each ACZ. The mathematical programming model is expressed as:

the classification of crops according to the Global Trade Analysis Project (GTAP). The livestock types included

cattle, sheep and chicken. The empirical model assumed that farmers must select from the portfolio of the

2 The study assumes that technological progress will increase yield by 1 per cent each year. To avoid non-stationary process, technological change is captured by equation 3.

3 See Atewamba for details on crop yields simulations.

4 The basin and sub-basin data are not reported but are available upon request.

seven cropping systems and the four livestock types by allocating land, labour and financial resources to maximize the discounted farm profit for each ACZ. The mathematical programming model is expressed as:

$$\underset{xcrop_{z,c,s,ty},xliver_{z,r,ty},tlab_{z,tm,ty}}{\text{Max}} \sum_{ty}\Big[e^{-0.03ty}\Big(\sum_z\sum_r\sum_k(share_{k,z}*xliver_{z,r,ty}*lprice_{k,r,ty})+\sum_z\sum_c\sum_k\sum_s(share_{k,z}*yield_{z,c,s,ty}*xcrop_{z,c,s,ty}*price_{k,c,ty})-\sum_{tm}\sum_z((fwage_{z,tm,ty}*famlab_{z,tm,ty}+twage_{z,tm,ty}*tlab_{z,tm,ty})/dpm)-\sum_r\sum_z\big((rations_{z,r,ty}+vetpr_{r,ty})*xliver_{z,r,ty}\big)-\sum_z\sum_c\sum_s(pcost_{z,c,ty}*xcrop_{z,c,s,ty})-\sum_z\sum_c\sum_s\sum_r\big((xcrop_{z,c,s,ty}+lio_{s,r}*1000*xliver_{z,r,ty})*landcost_{z,ty}\big)\Big)\Big] \quad (4)$$

Subject to

$$\sum_c xcrop_{z,c,s,ty} \leq 1000*landc_{z,s,ty} \quad (5)$$

$$\sum_r lio_{s,r}*xliver_{z,r,ty}*1000 \leq 1000*landl_{z,s,ty} \quad (6)$$

$$\sum_s\sum_c(labor_{c,tm}*xcrop_{z,c,s,ty})+\sum_r(llab_{tm,r}*xliver_{z,r,ty}) \leq famlab_{z,tm,ty}+tlab_{z,tm,ty} \quad (7)$$

$$\sum_c\sum_s(pcost_{z,c,ty}*xcrop_{z,c,s,ty})+\sum_r(rations_{z,r,ty}+vetpr_{r,ty})*xliver_{z,r,ty}+\sum_{tm}(twage_{z,tm,ty}*tlab_{z,tm,ty})/dpm+\sum_c\sum_s\sum_r(xcrop_{z,c,s,ty}+lio_{s,r}*1000*xliver_{z,r,ty})*landcost_{z,ty} \leq wcbar_{z,ty} \quad (8)$$

The objective function (4) contains six expressions.

The first expression

$$\Big(\sum_{ty}\Big[e^{-0.03ty}\Big(\sum_r\sum_z\Big((rations_{z,r,ty}+vetpr_{r,ty})*xliver_{z,r,ty}\Big)\Big)\Big]\Big)$$

is the total discounted livestock revenue[5] .

The second expression

$\Big(\sum_{ty}\Big[e^{-0.03ty}\Big(\sum_z\sum_c\sum_k\sum_s(share_{k,z}*yield_{z,c,s,ty}*xcrop_{z,c,s,ty}*price_{k,c,ty})\Big)\Big]\Big)$ represents the total discounted crop production revenue from all crops and groups of crops.

The third expression

$\Big(\sum_{ty}\Big[e^{-0.03ty}\Big(\sum_{tm}\sum_z((fwage_{z,tm,ty}*famlab_{z,tm,ty}+twage_{z,tm,ty}*tlab_{z,tm,ty})/dpm)\Big)\Big]\Big)$ is the total discounted labour costs.

The fourth expression

$\Big(\sum_{ty}\Big[e^{-0.03ty}\Big(\sum_r\sum_z\Big((rations_{z,r,ty}+vetpr_{r,ty})*xliver_{z,r,ty}\Big)\Big)\Big]\Big)$ represents the overall discounted livestock feeding and veterinary services costs.

The fifth expression

$\Big(\sum_{ty}\Big[e^{-0.03ty}\Big(\sum_z\sum_c\sum_s(pcost_{z,c,ty}*xcrop_{z,c,s,ty})\Big)\Big]\Big)$ is the overall discounted technology costs.

The sixth expression

$$\Big(\sum_{ty}\Big[e^{-0.03ty}\Big(\sum_z\sum_c\sum_s\sum_r\Big((xcrop_{z,c,s,ty}+lio_{s,r}*1000*xliver_{z,r,ty})*landcost_{z,ty}\Big)\Big)\Big]\Big)$$

represents the total discounted land cost. Equation (5) is the expression of crop land resource constraints.

5 It is assumed that none of the livestock produced are sold. The expression provides for a calculation of total livestock revenue in the objective function.

Equation (6) represents livestock land resource constraints. Labour resource constraints are accounted for by equation (7), and equation (8) accounts for financial resource constraints

Table 1 Definitions of model sets, parameters and variables

Sets, parameters and variables	Definition
Sets	
c	Set of seven crops and groups of crops studied in the model
r	Set of four livestock types studied in the model
s	Set of three soil types
km	Set of four technologies used in crop production
tm	Set of 12 months of the year
ty	Set of 5-year periods from 2010 to 2100 with 2004 as baseline
z	Set of 39 agro-climatic zones
k	Set of 14 countries included in the analyses
b	Set of five basins included in the analyses
Parameters	
$landc_{z,s,ty}$	Crop land per ACZ, soil type, and per period (thousand ha)
$landl_{z,s,ty}$	Livestock land per ACZ, soil type, and per period (thousand ha)
$rations_{z,r,ty}$	Livestock ration feeding per ACZ, livestock type, and per period (thousand USD)
$lio_{s,r}$	Land requirement per livestock type, and per soil type (1 ha per head)
$labor_{c,tm}$	Labour requirement per crop and group of crops type, and per month (person-days)
$llab_{tm,r}$	Labour requirement per livestock type, and per month (person-days)
$price_{k,c,ty}$	Crop prices per country, and per period (thousand USD per ton)
$yield_{z,c,ty}$	Yield of crop per ACZ, per soil type and per period (ton per ha)
$pcost_{z,c,ty}$	Technology costs of crop , per ACZ and per period (thousand USD)
$fwage_{z,tm,ty}$	Family reservation wage per ACZ, month and period (thousand USD per person-day)
$twage_{z,tm,ty}$	Hired labour wage per ACZ, month and period (thousand USD per person-day)
$famlab_{z,tm,ty}$	Family labour per ACZ, month and period (person-days)
$lprice_{k,r,ty}$	Livestock prices per country, and per period (USD per head)
$vetpr_{r,ty}$	Cost of veterinary services per livestock type, and per period (thousand USD)
$landcost_{z,ty}$	Land costs per ACZ, and per period (thousand USD)
$wcbar_{z,ty}$	Working capital per ACZ, and per period (thousand USD)
$share_{k,z}$	Crop land share of ACZs within countries
dpm	Number of working days per month
Variables	
$xcrop_{z,c,s,ty}$	Quantity of land in each ACZ allocated to crop or groups of crops , per soil type and per period (ha)
$xliver_{z,r,ty}$	Number of livestock produced in each ACZ, per type, and per period (head)
$tlab_{z,tm,ty}$	Hired labour to complement family labour per month, and per period in each ACZ (person-days)

1.2.4. PARAMETERIZATION OF THE MODEL

The parameters used in the bioeconomic model are derived from a number of sources. In addition to data on crop yields, and land acreage allocated to crops and livestock, intensive desk surveys were done to collect data on the numerous socioeconomic parameters required to perform the optimization. Indeed, many socioeconomic parameters used in the modelling are from previous published studies (including Louhichi and others, 2013; Louhichi and Paloma, 2014; and Lokonon and others, 2015). Some socioeconomic parameters were derived from the world development indicators (WDI) and from FAO databases. Many socioeconomic parameters are projected from 2010 to 2100.

The study postulated four socioeconomic scenarios to capture uncertainty about future economic prospects (Palazzo and others, 2014). Scenarios are not projections, predictions or forecasts; rather, they describe potential future conditions and how they could come about (Wilkinson and Eidinow, 2008). The socioeconomic scenarios employed two axes of uncertainty: (i) whether short-term or long-term priorities dominate in regional governance; and (ii) whether State or non-State actors are the driving force of change in the region. It was also assumed, however, that many other drivers could play a role in the scenario pathways (Palazzo and others, 2014). Those other drivers, such as population, GDP and political stability, were assumed to affect each socioeconomic scenario to allow for comparisons to be made between them (Palazzo and others 2014). The present study used the following four socioeconomic scenarios (also referred to as shared socioeconomic pathways (SSPs)), which were developed by Palazzo and others (2014):

- Cash, control and calories: In this scenario, State actors are the dominant force in West Africa and short-term priorities (referred to as SSP1) prevail;
- Self determination: In this scenario, State actors are the dominant force in West Africa and long-term priorities (referred to as SSP2) prevail;
- Civil society to the rescue?: In this scenario, non-State actors are the dominant force in West Africa and long-term priorities (SSP3) prevail;
- Save yourself: In this scenario, non-State actors are the driving force in West Africa and short-term priorities (SSP4) prevail .

The four SSPs were used to project the model's socioeconomic parameters. Crop and livestock prices were projected based on annual inflation rates. The inflation rates differ across SSPs and across countries of the West African Economic and Monetary Union (WAEMU) and non-WAEMU countries: (i) SSP1 — 6 per cent for WAEMU countries and 12 per cent for non-WAEMU; (ii) SSP2 — 2 per cent for WAEMU countries and 8 per cent for non-WAEMU; (iii) SSP3 — 4 per cent for WAEMU countries and 10 per cent for non-WAEMU; (iv) SSP4 — 8 per cent for WAEMU countries and 15 per cent for non-WAEMU.

Climate scenarios were also incorporated in the study (Sylla, 2015) to project future crop yields. The climate scenarios were based on a regional climate model (RCM). A Coupled Model Intercomparison Project, Phase 5 was selected and dynamically downscaled using a high resolution RCM for the West Africa region for two core Intergovernmental Panel on Climate Change RCPs, namely: RCP4.5 (a mid-level future greenhouse gas forcing); and RCP8.5 (a higher-level greenhouse gas (GHG) forcing) (Sylla, 2015). The climate projections estimate future precipitation levels, near-surface temperatures and evapotranspiration rates.

1.2.5. BIOECONOMIC MODEL CALIBRATION

The economic mathematical programming model was calibrated before it was used in climate change impact simulations. The model was calibrated using observed data for the baseline year of 2004. Close approximations of observed land allocation for various crops per land use in 2004 were obtained using a traditional PMP approach (Howitt, 1995), which has been used in many other studies (for example Egbendewe-Mondzozo and others, 2015; Egbendewe-Mondzozo and others, 2011; Heckelei and others, 2012). In fact, PMP is often used in regional bioeconomic models (Howitt, 1995; Rohm and Dabbert, 2003). One of the strengths of the PMP calibration approach is that the model's outputs are closer to real-world scenarios (Kanellopoulos and others, 2010). The usual three steps of the PMP approach were followed during the calibration procedure (Howitt, 1995; Kanellopoulos and others, 2010). Firstly, a raw linear programming model was run to understand the model behaviour without calibration: only vegetables and fruits (bananas, cassava, plantains, potatoes, sweet potatoes, and yam) were found to grow in all ACZs. Secondly, the simulation model was repeated, with land-use data derived from countries' crop land in 2004 in order to replicate observed 2014 crop land at country level. Finally, the shadow prices from the second step were used to calculate the coefficients of the marginal yield functions, which were used to calibrate the model as a non-linear quadratic optimization model under the assumption of a decreasing linear marginal yield. Following this calibration procedure, the model was able to predict crop land allocation at country level for 2004 with an average percentage deviation of 13.9 per cent, which is within the acceptable range in modelling farmer behaviour (Hazell & Norton, 1986; Howitt, 1995).

In accordance with Egbendewe-Mondzozo and others (2015), the study assumed a land penetration rate of plus and minus 2 per cent each year to constrain crop land allocation dynamically in the simulations, taking into account the fact that total crop land use cannot be greater than the available arable land. This allowed the authors of the study to incorporate a dynamic component into the rather static PMP approach, which provided for more realistic estimates of acreage over time. It is worth noting that this approach did not allow the model to capture extreme climatic events over the short term. As many farmers in ECOWAS countries consume their own produce (Seo and others, 2009), there may not be a significant shift in acreage patterns in the short term. Therefore, our calibration approach is consistent with the observed rigidity in short-term acreage expansion. A similar calibration approach was used for livestock production in ECOWAS countries.

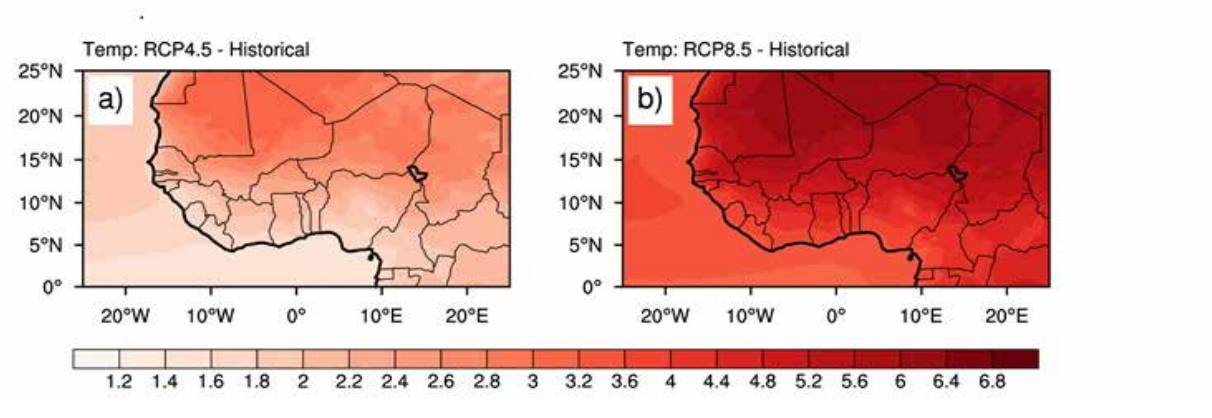
3. RESULTS AND DISCUSSION

ECOLAND was used to investigate climate change-related crop supply drivers. Given the long time period required for climate change impact assessments, the findings should not be interpreted as a projection or forecast, but rather as the probable outcome of the interaction of a number of imperfectly understood driving forces (Medellin-Azuara and others, 2011).

1.3. CLIMATE CHANGE IN THE ECOWAS REGION

Crop yields were forecast under RCP4.5 and RCP8.5. A regional increase in temperature is projected using a multi-model RCM ensemble for the entire ECOWAS region (Sylla, 2015).[6] However, the degree of warming is expected to vary across the region. The smallest mean temperature increases are likely to occur in the orographic zones of Guinea, the Cameroon Mountains, and the Jos Plateau. More significant warming is foreseen for the area north of the Gulf of Guinea, while the greatest temperature increases are foreseen in the Sahara. The temperature changes are substantially larger in the high-level GHG forcing scenario (RCP8.5), in which an increase of between 4K and 7K is predicted, as compared with the mid-level GHG forcing scenario (RCP4.5), under which an increase of between 1K and 3.6K is foreseen. (see Figure). The diurnal temperature range under RCP4.5 is predicted to increase throughout the ECOWAS region, with the greatest increases occurring in northern Mali, the Niger and Senegal. However, it is expected to decrease in Côte d'Ivoire, southern Ghana, Liberia and Sierra Leone. Greater increases in the diurnal temperature range are expected to occur in the RCP8.5 scenario than in the RCP4.5 scenario.

Figure III Projected changes in mean seasonal temperature (in K or oC) (future minus historical temperatures) for the RCM ensemble under (a) RCP4.5 and (b) RCP8.5



Source: *Sylla (2015).*

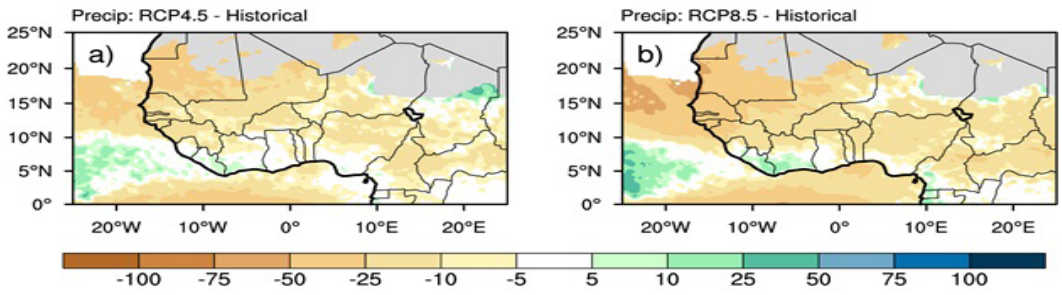
A substantial reduction in seasonal mean precipitation is predicted throughout the ECOWAS region in both RCP scenarios, with the exception of southern Côte d'Ivoire and Sierra Leone (Sylla, 2015). In the RCP4.5 scenario, future precipitation decreases by between 5 and 25 per cent, while in the RCP8.5 scenario it decreases by more than 50 per cent in certain areas, as compared with historical data (see

6 As many as 130 years of simulations were performed up to the year 2100, and RCP projections for the years 2070–2099 were compared with data from the recent historical period (from 1976 to 2005) Historical daily climate data were used for the period 1970–2005, and climate data calculated for the years 2006–2100.

figure IV). Guinea, Mali and Senegal are the ECOWAS countries that are expected to experience the largest decreases in precipitation.

Moreover, the length of dry spells and the frequency of very heavy precipitation events are both projected to increase substantially under both RCP scenarios, with the largest increases occurring under RCP8.5. A dipole pattern is expected for wet spells, with the length of wet spells decreasing in countries along the Gulf of Guinea and increasing in the Sahel.

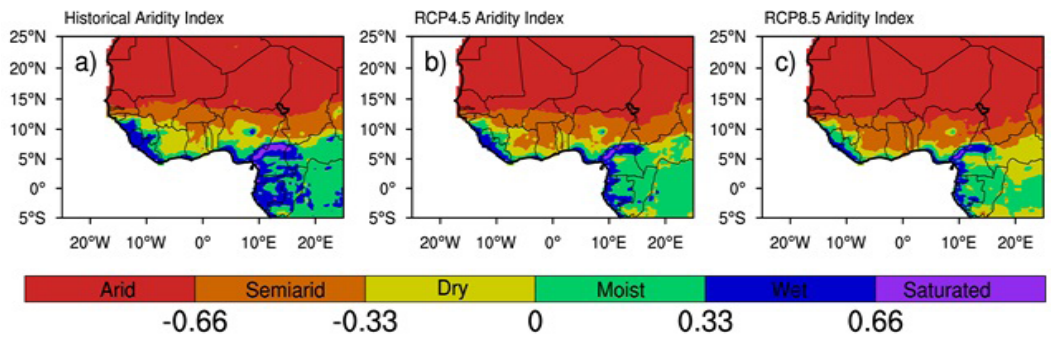
Figure IV Projected changes in mean seasonal precipitation (per cent) (future minus historical values) for the RCM ensemble under RCP4.5 and RCP8.5



Source: *Sylla (2015).*

Projected aridity distribution in the RCP4.5 and RCP8.5 scenarios is shown in figure V. Compared with historical data, the northern Sahel and the Sahara are predicted to become more arid, while the semi-arid band over the Sahel is expected to move southward. Less extensive wet and moist climates are likely be found in orographic areas and along the Gulf of Guinea coastline, (Sylla, 2015). A shift towards more semi-arid and arid climes is projected for the entire ECOWAS region. The shift is generally more pronounced in the RCP8.5 scenario.

Figure V Aridity index for the RCM ensemble (historical data and projections under RCP4.5 and RCP8.5 scenarios)



Source: *Sylla (2015)*

1.4. CROP LAND ALLOCATION AND PRODUCTION WITHOUT CLIMATE CHANGE

As previously mentioned, the model was calibrated using data on crop acreage in 2004 at country level with an average percentage deviation of 13.9 per cent. Estimated crop land allocation and crop production are shown in table 2. Crop acreage and production were shown to vary across countries as a result of different agricultural conditions on the ground. Three groups of crops were not produced by certain countries in 2004: sugarcane was not produced by the Gambia (Sowe and others, 2015); Liberia and Sierra Leone did not produce cotton (Rhodes and others, 2015); and Guinea-Bissau and Niger did not produce cocoa, coffee or sesame (Cassamá and others, 2015; Maman and others, 2015). Simulations

without climate change were conducted to understand agricultural production paths under different socioeconomic scenarios in the absence of climate change in the region, with a view to establishing baseline scenarios against which the impact of climate change could be estimated. The findings show that, without climate change, acreage and production were likely to increase for all crops in the years ahead.

Table 2 Acreage and production in 2004

	Acreage (thousand ha)							Production (thousand tons)						
	Paddy rice	Cereals	Vegetables and fruits	Oil seeds	Sugarcane	Cotton	Cocoa, coffee and sesame	Paddy rice	Cereals	Vegetables and fruits	Oil seeds	Sugarcane	Cotton	Cocoa, coffee and sesame
Benin	24.8	940.2	412.9	473.0	1.9	116.1	14.6	41.8	1014.0	4131.3	373.1	53.7	103.5	7.1
Burkina Faso	49.5	2959.8	19.9	336.6	3.6	14.1	1.5	86.0	2859.3	184.6	247.0	307.4	12.9	0.7
Côte d'Ivoire	341.0	383.7	1290.5	499.2	23.0	257.6	1063.1	552.5	556.1	11094.5	419.5	1372.3	199.6	504.2
Gambia	5.2	173.4	2.7	47.4		1.4	0.7	11.7	165.1	25.4	42.8		1.2	0.3
Ghana	119.4	767.2	1457.7	476.7	5.5	25.0	850.0	185.8	935.5	13000.8	414.6	408.3	20.3	399.5
Guinea	691.1	83.6	342.9	191.2	5.2	31.9	64.7	1040.7	110.4	2554.4	170.2	295.8	32.5	31.8
Guinea-Bissau	65.0	61.9	16.3	154.3	0.2	4.1		107.5	83.6	158.5	133.4	7.8	3.6	
Liberia	47.1	6.9	109.6	5.5	0.1		10.0	62.5	8.7	717.8	4.7	7.3		4.5
Niger	23.4	7364.2	10.7	3090.1	3.8	10.0		43.7	6503.1	210.9	1834.3	325.0	9.7	
Nigeria	2348.0	12772.1	8008.0	6962.0	43.0	632.0	1230.6	3734.9	14608.6	73628.7	5971.7	4746.8	505.6	581.1
Senegal	81.5	890.9	62.1	589.0	7.1	43.6	1.2	184.4	807.0	551.9	367.2	662.9	39.2	0.6
Sierra Leone	452.8	67.5	312.7	120.0	1.0		47.4	556.0	84.7	2189.9	99.3	51.1		22.5
Togo	32.3	321.3	176.1	219.4	0.9	117.7	69.9	51.2	361.7	1594.2	194.0	49.2	94.2	34.3

Paddy rice acreage and production follow the same patterns under all SSPs. However, in Senegal, they are almost 35 per cent lower during the second half of the twenty-first century than in the first half of that century. Cereals acreage and production are lower under SSP2 than under other SSPs for certain countries, including Burkina Faso, Mali, the Niger, Nigeria and Senegal throughout the century, and for Benin, the Gambia, Ghana and Togo, the same case applies but the time span is limited to between 2090 and 2100. In 2010, cereals acreage and production are forecast to be lower in Benin, Burkina Faso, the Gambia, Mali, the Niger, Nigeria and Senegal under the SSP2 than under SSP1. Vegetables and fruits, sugarcane, cocoa, coffee and sesame acreage and production are not heterogeneous across the SSPs. Although oil seeds, and cotton acreage and production follow the same patterns for all countries under SSP1, SSP3 and SSP4, they differ substantially under SSP2. Indeed, oil seeds, and cotton acreage and production are lower under SSP2 than SSP1 for certain countries, including Burkina Faso, Mali, the Niger, Nigeria and Senegal.

1.5. CLIMATE CHANGE IMPLICATIONS IN TERMS OF CROP LAND ALLOCATION

The changes in land-use patterns for each climate scenario were analysed for all SSPs.

1.5.1. PADDY RICE ACREAGE

The distribution of paddy rice acreage follows the same patterns across SSPs under RCP4.5 and RCP8.5 (see tables 3 and 4). Under RCP4.5, paddy rice acreage falls from 2060 to the end of the century in all countries. However, countries are unevenly affected. By 2080, certain countries, including Benin, Burkina Faso and Mali are likely to see a decrease in paddy rice acreage by 8.5 per cent, 3.5 per cent, and 6.8 per cent, respectively, while other countries, including the Gambia, Guinea-Bissau and the Niger are unlikely to experience any change. The impact of climate change on paddy rice acreage is also uneven across countries under RCP8.5. Indeed, countries such as Benin, Burkina Faso, the Gambia, Guinea-Bissau, Mali, the Niger and Senegal do not experience any change in paddy rice acreage under that scenario. Moreover, while some countries are expected to be negatively affected by the climate change under the harsh climate change scenario after 2070, climate change is then expected to have a positive impact in those counties at the end of the century. The impact of climate change on paddy rice acreage is greater under RCP4.5 than under RCP8.5. It should be noted, however, that such an impact varies across ACZs within countries. For example, in the harsh climate change scenario, negative changes in paddy rice acreage are observed in loamy soils for ACZ 3, while positive changes are observed in loamy soils for ACZ 15.

Table 3 Impact of climate change on paddy rice acreage under RCP4.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	-8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-8.5	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	-3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.5	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	-0.3	-1.9	-46.9	-2.1	-1.1	0.0	0.0	0.0	0.0	-0.3	-1.9	-46.9	-2.1	-1.1
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	-1.4	-7.5	-12.4	-10.2	-5.7	0.0	0.0	0.0	0.0	-1.4	-7.5	-12.4	-10.2	-5.7
Guinea	0.0	0.0	0.0	0.0	-0.4	-2.2	-5.7	4.0	-1.8	0.0	0.0	0.0	0.0	-0.4	-2.2	-5.7	4.0	-1.8
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	-1.7	-9.1	-10.6	-1.6	-8.6	0.0	0.0	0.0	0.0	-1.7	-9.1	-10.6	-1.6	-8.6
Mali	0.0	0.0	0.0	0.0	0.0	0.0	-6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-6.8	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	-1.0	0.0	0.0	-1.6	-10.9	-36.2	-17.6	-9.7	0.0	-1.0	0.0	0.0	-1.6	-10.9	-36.2	-17.6	-9.7
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	-3.0	-17.0	-22.2	-28.6	-20.3	0.0	0.0	0.0	0.0	-3.0	-17.0	-22.2	-28.6	-20.3
Togo	0.0	0.0	0.0	0.0	0.0	0.0	-13.7	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13.7	2.7	0.0
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	-8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-8.5	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	-3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.5	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	-0.3	-1.9	-46.9	-2.1	-1.1	0.0	0.0	0.0	0.0	-0.3	-1.9	-46.9	-2.1	-1.1
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	-1.4	-7.5	-12.4	-10.2	-5.7	0.0	0.0	0.0	0.0	-1.4	-7.5	-12.4	-10.2	-5.7
Guinea	0.0	0.0	0.0	0.0	-0.4	-2.2	-5.7	4.0	-1.8	0.0	0.0	0.0	0.0	-0.4	-2.2	-5.7	4.0	-1.8
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	-1.7	-9.1	-10.6	-1.6	-8.6	0.0	0.0	0.0	0.0	-1.7	-9.1	-10.6	-1.6	-8.6
Mali	0.0	0.0	0.0	0.0	0.0	0.0	-6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-6.8	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	-1.0	0.0	0.0	-1.6	-10.9	-36.2	-17.6	-9.7	0.0	-1.0	0.0	0.0	-1.6	-10.9	-36.2	-17.6	-9.7

Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	-3.0	-17.0	-22.2	-28.6	-20.3	0.0	0.0	0.0	0.0	-3.0	-17.0	-22.2	-28.6	-20.3
Togo	0.0	0.0	0.0	0.0	0.0	0.0	-13.7	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13.7	2.7	0.0

Table 4 Impact of climate change on paddy rice acreage under RCP8.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	-1.9	-3.8	0.1	2.6	0.0	0.0	0.0	0.0	0.0	-1.9	-3.8	0.1	2.6
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	-7.5	-8.4	-10.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.5	-8.4	-10.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	-2.2	-3.7	5.9	11.6	0.0	0.0	0.0	0.0	0.0	-2.2	-3.7	5.9	11.6
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	-9.1	-10.2	-1.6	17.2	0.0	0.0	0.0	0.0	0.0	-9.1	-10.2	-1.6	17.2
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	-10.9	-15.0	-14.9	0.2	0.0	0.0	0.0	0.0	0.0	-10.9	-15.0	-14.9	0.2
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	-17.0	-22.1	-28.6	3.7	0.0	0.0	0.0	0.0	0.0	-17.0	-22.1	-28.6	3.7
Togo	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	4.3	4.6	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	4.3	4.6
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	-1.9	-3.8	0.1	2.6	0.0	0.0	0.0	0.0	0.0	-1.9	-3.8	0.1	2.6
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	-7.5	-8.4	-10.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.5	-8.4	-10.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	-2.2	-3.7	5.9	11.6	0.0	0.0	0.0	0.0	0.0	-2.2	-3.7	5.9	11.6

Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	-9.1	-10.2	-1.6	17.2	0.0	0.0	0.0	0.0	0.0	-9.1	-10.2	-1.6	17.2
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	-10.9	-15.0	-14.9	0.2	0.0	0.0	0.0	0.0	0.0	-10.9	-15.0	-14.9	0.2
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	-17.0	-22.1	-28.6	3.7	0.0	0.0	0.0	0.0	0.0	-17.0	-22.1	-28.6	3.7
Togo	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	4.3	4.6	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	4.3	4.6

Table 5 Paddy rice acreage without climate change (thousand ha)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	34.0	41.4	50.5	51.4	60.1	72.1	86.1	103.4	123.3	34.0	41.4	50.5	51.4	60.1	72.1	86.1	103.4	123.3
Burkina Faso	68.0	82.9	101.0	120.2	145.8	177.5	216.2	263.4	319.9	68.0	82.9	101.0	120.2	145.8	177.5	216.2	263.4	319.9
Côte d'Ivoire	468.1	570.6	693.7	777.4	916.8	1089.0	1280.8	1431.5	1507.4	468.1	570.6	693.7	777.4	916.8	1089.0	1280.8	1431.5	1507.4
Gambia	7.1	8.7	10.6	12.9	15.7	19.1	23.3	25.5	26.7	7.1	8.7	10.6	12.9	15.7	19.1	23.3	25.5	26.7
Ghana	163.9	199.8	243.5	275.7	330.4	391.1	441.8	452.0	433.6	163.9	199.8	243.5	275.7	330.4	391.1	441.8	452.0	433.6
Guinea	948.7	1156.5	1406.9	1687.1	2021.2	2360.6	2555.0	2496.8	2418.0	948.7	1156.5	1406.9	1687.1	2021.2	2360.6	2555.0	2496.8	2418.0
Guinea-Bissau	89.2	108.8	130.6	157.1	180.4	198.3	209.0	214.6	217.5	89.2	108.8	130.6	157.1	180.4	198.3	209.0	214.6	217.5
Liberia	64.6	78.8	96.0	117.0	142.7	168.7	180.5	167.2	150.9	64.6	78.8	96.0	117.0	142.7	168.7	180.5	167.2	150.9
Mali	132.7	161.8	197.2	239.4	291.6	355.4	433.2	528.1	639.2	132.7	161.8	197.2	239.4	291.6	355.4	433.2	528.1	639.2
Niger	32.1	39.1	47.7	58.1	70.9	86.4	105.3	128.4	156.5	32.1	39.1	47.7	58.1	70.9	86.4	105.3	128.4	156.5
Nigeria	3223.3	3877.7	4651.0	5291.6	6203.1	7120.1	7631.5	8008.3	8112.8	3223.3	3877.7	4651.0	5291.6	6203.1	7120.1	7631.5	8008.3	8112.8
Senegal	111.9	136.4	166.2	202.2	246.3	300.2	365.9	431.2	504.2	111.9	136.4	166.2	131.2	154.4	183.8	220.4	250.9	282.0
Sierra Leone	621.7	757.8	923.8	1126.0	1372.6	1583.3	1518.3	1345.6	1129.4	621.7	757.8	923.8	1126.0	1372.6	1583.3	1518.3	1345.6	1129.4
Togo	44.3	54.0	65.7	77.0	92.0	110.6	133.1	152.9	174.5	44.3	54.0	65.7	77.0	92.0	110.6	133.1	152.9	174.5

	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	34.0	41.4	50.5	51.4	60.1	72.1	86.1	103.4	123.3	34.0	41.4	50.5	51.4	60.1	72.1	86.1	103.4	123.3
Burkina Faso	68.0	82.9	101.0	120.2	145.8	177.5	216.2	263.4	319.9	68.0	82.9	101.0	120.2	145.8	177.5	216.2	263.4	319.9
Côte d'Ivoire	468.1	570.6	693.7	777.4	916.8	1089.0	1280.8	1431.5	1507.4	468.1	570.6	693.7	777.4	916.8	1089.0	1280.8	1431.5	1507.4
Gambia	7.1	8.7	10.6	12.9	15.7	19.1	23.3	25.5	26.7	7.1	8.7	10.6	12.9	15.7	19.1	23.3	25.5	26.7
Ghana	163.9	199.8	243.5	275.7	330.4	391.1	441.8	452.0	433.6	163.9	199.8	243.5	275.7	330.4	391.1	441.8	452.0	433.6
Guinea	948.7	1156.5	1406.9	1687.1	2021.2	2360.6	2555.0	2496.8	2418.0	948.7	1156.5	1406.9	1687.1	2021.2	2360.6	2555.0	2496.8	2418.0
Guinea-Bissau	89.2	108.8	130.6	157.1	180.4	198.3	209.0	214.6	217.5	89.2	108.8	130.6	157.1	180.4	198.3	209.0	214.6	217.5
Liberia	64.6	78.8	96.0	117.0	142.7	168.7	180.5	167.2	150.9	64.6	78.8	96.0	117.0	142.7	168.7	180.5	167.2	150.9
Mali	132.7	161.8	197.2	239.4	291.6	355.4	433.2	528.1	639.2	132.7	161.8	197.2	239.4	291.6	355.4	433.2	528.1	639.2
Niger	32.1	39.1	47.7	58.1	70.9	86.4	105.3	128.4	156.5	32.1	39.1	47.7	58.1	70.9	86.4	105.3	128.4	156.5
Nigeria	3223.3	3877.7	4651.0	5291.6	6203.1	7120.1	7631.5	8008.3	8112.8	3223.3	3877.7	4651.0	5291.6	6203.1	7120.1	7631.5	8008.3	8112.8
Senegal	111.9	136.4	166.2	202.2	246.3	300.2	365.9	431.2	504.2	111.9	136.4	166.2	202.2	246.3	300.2	365.9	431.2	504.2
Sierra Leone	621.7	757.8	923.8	1126.0	1372.6	1583.3	1518.3	1345.6	1129.4	621.7	757.8	923.8	1126.0	1372.6	1583.3	1518.3	1345.6	1129.4
Togo	44.3	54.0	65.7	77.0	92.0	110.6	133.1	152.9	174.5	44.3	54.0	65.7	77.0	92.0	110.6	133.1	152.9	174.5

1.5.2. MAIZE, SORGHUM AND MILLET ACREAGE

The distribution of maize, sorghum and millet acreage follows the same pattern for all SSPs under RCP4.5 and RCP8.5 (see tables 6 and 7). From 2020 until 2050, climate change is expected to have an insignificant impact on cereal acreage in almost all ECOWAS countries, except for Mali, the Niger, Nigeria and Senegal, where acreage is expected to increase under SSP1, SSP2 and SSP3 from 2020. From 2050 until the end on the century, climate change is likely to result in less arable land being allocated to the cultivation of maize, sorghum and millet in all ECOWAS countries except for the Gambia and the Niger, where the acreage of land allocated to those crops is expected to increase. Certain countries, including Benin, Guinea, Guinea-Bissau and Sierra Leone are likely to witness a decrease in the acreage of land allocated to cereal production of more than 50 per cent by the end of the century in all climatic and socioeconomic scenarios. A decrease of less than 10 per cent in the acreage of land allocated to cereal production is foreseen in Burkina Faso, the Gambia, Ghana and Nigeria by the end of the century in all climatic and socioeconomic scenarios. In general, there is very little variation in cereal crop acreage in ECOWAS countries under the various climatic and socioeconomic scenarios. Climate change is, however, expected to have an impact on the amount of land allocated to maize, sorghum and millet production across ACZs, with more land allocated to those crops in certain ACZs, such as in ACZ 20 (loamy soils) and ACZ 22 (loamy and sandy soils), and less land allocated in other ACZs, such as ACZ 32 and ACZ 34 (clay soils). At the ACZ level, the prevailing SSP is expected to modify the impact of climate change on cereal acreage.

Table 6 Impact of climate change on cereal acreage under RCP4.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.2	-5.6	-26.7	-44.8	-50.6	0.0	-1.3	0.0	0.0	0.2	-5.6	-26.7	-50.6	-61.8
Burkina Faso	0.3	0.0	0.0	0.0	0.7	0.2	-0.1	-0.2	0.3	2.9	-18.0	0.0	0.0	0.7	-0.1	0.3	7.2	1.8
Côte d'Ivoire	0.0	0.0	0.0	2.9	26.0	-22.4	-7.5	-14.7	0.0	0.0	0.0	0.0	2.9	26.0	-22.4	-7.5	-14.7	0.0
Gambia	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	-20.3	0.0	0.1	0.2	0.1	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	-8.8	-7.5	-4.5	-4.1	-5.2	0.0	0.0	0.0	0.0	-8.8	-7.5	-4.5	-4.1	-5.5
Guinea	0.0	0.0	0.0	0.6	-7.3	-1.2	-0.3	-88.3	0.0	0.0	0.0	0.0	0.6	-7.3	-1.2	-0.3	-88.3	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6
Liberia	0.0	0.0	0.0	0.0	-38.5	0.0	0.0	-94.5	0.0	0.0	0.0	0.0	0.0	-38.5	0.0	0.0	-94.5	0.0
Mali	3.2	0.0	0.0	0.0	5.7	2.0	-0.4	-0.4	3.9	11.4	-15.0	0.0	0.0	4.0	-0.4	3.5	29.5	14.0
Niger	31.3	0.0	0.0	0.0	87.2	3.8	0.0	0.0	8.1	35.7	-5.3	0.0	0.0	5.8	0.0	6.1	78.6	34.4
Nigeria	0.6	0.0	0.0	0.8	3.0	0.4	-1.1	-1.1	1.5	2.3	-5.6	0.0	0.8	3.3	-0.9	0.8	8.7	3.2
Senegal	0.4	0.0	0.0	0.0	2.6	11.9	-0.1	-0.1	20.4	14.8	-29.7	0.0	0.0	20.7	-0.1	21.7	69.3	89.7
Sierra Leone	0.0	0.0	0.0	0.0	-79.3	-19.1	-5.7	-71.1	0.0	0.0	0.0	0.0	0.0	-79.3	-19.1	-5.7	-71.1	0.0
Togo	0.0	0.0	0.0	0.1	0.8	-10.7	-21.3	-32.5	-38.1	0.0	0.0	0.0	0.1	0.8	-10.7	-21.3	-32.5	-38.2
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.2	-5.6	-26.7	-44.8	-50.6	0.0	0.0	0.0	0.0	0.2	-5.6	-26.7	-44.8	-50.6
Burkina Faso	0.1	0.0	0.0	0.0	0.7	0.2	-0.1	-0.2	0.3	0.0	0.0	0.0	0.0	0.7	0.2	-0.1	0.3	0.3
Côte d'Ivoire	0.0	0.0	0.0	2.9	26.0	-22.4	-7.5	-14.7	0.0	0.0	0.0	0.0	2.9	26.0	-22.4	-7.5	-14.7	0.0
Gambia	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	-8.8	-7.5	-4.5	-4.1	-5.2	0.0	0.0	0.0	0.0	-8.8	-7.5	-4.5	-4.1	-5.2

Guinea	0.0	0.0	0.0	0.6	-7.3	-1.2	-0.3	-88.3	0.0	0.0	0.0	0.0	0.6	-7.3	-1.2	-0.3	-88.3	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6
Liberia	0.0	0.0	0.0	0.0	-38.5	0.0	0.0	-94.5	0.0	0.0	0.0	0.0	0.0	-38.5	0.0	0.0	-94.5	0.0
Mali	3.1	0.0	0.0	0.0	5.7	2.0	-0.4	-0.4	3.9	0.0	0.0	0.0	0.0	5.7	2.0	-0.4	3.4	3.9
Niger	31.9	0.0	0.0	0.0	87.2	3.8	0.0	0.0	8.1	0.0	0.0	0.0	0.0	87.2	3.8	0.0	6.8	8.1
Nigeria	-0.1	0.0	0.0	0.8	3.0	0.4	-1.1	-1.1	1.5	0.0	0.0	0.0	0.8	3.0	0.4	-1.1	1.2	1.5
Senegal	-0.9	0.0	0.0	0.0	2.6	11.9	-0.1	-0.1	20.4	0.0	0.0	0.0	0.0	2.6	11.9	-0.1	18.4	20.4
Sierra Leone	0.0	0.0	0.0	0.0	-79.3	-19.1	-5.7	-71.1	0.0	0.0	0.0	0.0	0.0	-79.3	-19.1	-5.7	-71.1	0.0
Togo	0.0	0.0	0.0	0.1	0.8	-10.7	-21.3	-32.5	-38.1	0.0	0.0	0.0	0.1	0.8	-10.7	-21.3	-32.5	-38.1

Table 7 Impact of climate change on cereal acreage under RCP8.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.1	-3.5	-5.6	-26.7	-44.8	-50.4	0.0	0.0	0.0	0.1	-3.5	-5.6	-26.7	-50.6	-61.8
Burkina Faso	0.3	0.0	0.0	0.3	0.6	-0.1	-0.1	-0.2	0.9	2.9	0.0	0.0	0.3	0.5	-0.1	-0.1	7.2	-0.2
Côte d'Ivoire	0.0	0.0	0.0	2.9	-31.9	-22.4	-7.9	-14.7	-18.3	0.0	0.0	0.0	2.9	-31.9	-22.4	-7.9	-14.7	-18.3
Gambia	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	-1.6
Ghana	0.0	0.0	0.0	0.0	-10.6	-7.5	-4.5	-4.1	-5.2	0.0	0.0	0.0	0.0	-10.6	-7.5	-4.5	-4.1	-5.5
Guinea	0.0	0.0	0.0	0.6	-15.7	-1.2	-3.8	-88.3	-92.0	0.0	0.0	0.0	0.6	-15.7	-1.2	-3.8	-88.3	-92.0
Guinea-Bissau	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6
Liberia	0.0	0.0	0.0	0.0	-38.5	0.0	-3.9	-94.5	-96.3	0.0	0.0	0.0	0.0	-38.5	0.0	-3.9	-94.5	-96.3
Mali	3.3	0.0	0.0	0.8	5.3	-0.3	-0.4	-0.4	5.6	11.4	0.0	0.0	0.9	3.5	-0.4	-0.4	29.5	10.0
Niger	32.3	0.0	0.0	1.0	87.2	0.0	0.0	0.0	11.9	35.7	0.0	0.0	1.4	5.8	0.0	0.0	78.6	29.0
Nigeria	0.6	0.0	0.0	2.3	0.2	-1.7	-1.1	-1.1	5.9	2.3	0.0	0.0	2.4	0.2	-1.8	-1.2	8.7	1.8
Senegal	0.4	0.0	0.0	1.9	2.6	-0.1	-0.1	-0.1	24.3	14.8	0.0	0.0	2.8	20.6	-0.1	-0.1	69.3	76.4

Sierra Leone	0.0	0.0	0.0	0.0	-79.3	-19.1	-8.2	-71.1	-78.8	0.0	0.0	0.0	0.0	-79.3	-19.1	-8.2	-71.1	-78.8
Togo	0.0	0.0	0.0	0.1	-8.2	-10.7	-21.3	-32.5	-39.1	0.0	0.0	0.0	0.1	-8.2	-10.7	-21.3	-32.5	-39.1
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.1	-3.5	-5.6	-26.7	-44.8	-50.4	0.0	0.0	0.0	0.1	-3.5	-5.6	-26.7	-44.8	-50.4
Burkina Faso	0.3	0.0	0.0	0.3	0.6	-0.1	-0.1	-0.2	0.9	0.0	0.0	0.0	0.3	0.6	0.2	-0.1	-0.2	0.9
Côte d'Ivoire	0.0	0.0	0.0	2.9	-31.9	-22.4	-7.9	-14.7	-18.3	0.0	0.0	0.0	2.9	-31.9	-22.4	-7.9	-14.7	-18.3
Gambia	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.1
Ghana	0.0	0.0	0.0	0.0	-10.6	-7.5	-4.5	-4.1	-5.2	0.0	0.0	0.0	0.0	-10.6	-7.5	-4.5	-4.1	-5.2
Guinea	0.0	0.0	0.0	0.6	-15.7	-1.2	-3.8	-88.3	-92.0	0.0	0.0	0.0	0.6	-15.7	-1.2	-3.8	-88.3	-92.0
Guinea-Bissau	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6	0.0	0.0	0.0	0.0	-14.4	-11.0	-29.2	-51.1	-60.6
Liberia	0.0	0.0	0.0	0.0	-38.5	0.0	-3.9	-94.5	-96.3	0.0	0.0	0.0	0.0	-38.5	0.0	-3.9	-94.5	-96.3
Mali	3.6	0.0	0.0	0.8	5.3	-0.3	-0.4	-0.4	5.6	0.0	0.0	0.0	0.8	5.3	2.0	-0.4	-0.4	5.6
Niger	33.3	0.0	0.0	1.0	87.2	0.0	0.0	0.0	11.9	0.0	0.0	0.0	1.0	87.2	3.8	0.0	0.0	11.9
Nigeria	0.6	0.0	0.0	2.3	0.2	-1.7	-1.1	-1.1	5.9	0.0	0.0	0.0	2.3	0.2	-0.4	-1.1	-1.1	5.9
Senegal	0.5	0.0	0.0	1.9	2.6	-0.1	-0.1	-0.1	24.3	0.0	0.0	0.0	1.9	2.6	11.9	-0.1	-0.1	24.3
Sierra Leone	0.0	0.0	0.0	0.0	-79.3	-19.1	-8.2	-71.1	-78.8	0.0	0.0	0.0	0.0	-79.3	-19.1	-8.2	-71.1	-78.8
Togo	0.0	0.0	0.0	0.1	-8.2	-10.7	-21.3	-32.5	-39.1	0.0	0.0	0.0	0.1	-8.2	-10.7	-21.3	-32.5	-39.1

Table 8 Cereals acreage without climate change (million ha)

	SSP1: Cash, Control & Calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	1.3	1.5	1.7	1.9	2.1	2.2	2.4	2.6	2.8	1.2	1.5	1.7	1.9	2.1	2.2	2.4	2.3	2.3
Burkina Faso	3.9	4.9	5.8	6.9	7.7	8.2	8.8	9.5	10.4	3.4	4.7	5.6	6.6	7.3	7.8	8.4	7.3	3.1
Côte d'Ivoire	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2
Gambia	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.4	0.2
Ghana	1.1	1.3	1.4	1.5	1.5	1.4	1.3	1.2	1.2	1.1	1.3	1.4	1.5	1.5	1.4	1.3	1.2	1.1

Guinea	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Guinea-Bissau	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	3.5	4.6	5.4	6.2	6.8	7.2	7.6	8.0	8.5	3.1	3.9	4.6	5.2	5.6	5.9	6.3	5.6	2.7
Niger	7.2	10.3	9.6	8.7	7.7	6.7	6.8	6.9	7.1	7.0	6.7	6.5	6.2	6.1	6.1	6.2	2.8	1.7
Nigeria	17.0	19.9	22.2	23.9	24.6	24.2	24.1	24.2	24.4	16.2	19.2	21.3	22.7	23.1	22.7	22.6	21.0	13.0
Senegal	1.1	1.4	1.7	2.0	2.4	2.5	2.7	2.9	3.2	0.9	1.1	1.3	1.4	1.6	1.8	2.0	1.8	0.8
Sierra Leone	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.1
Togo	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.9	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.9
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	1.2	1.5	1.7	1.9	2.1	2.2	2.4	2.6	2.8	1.3	1.5	1.7	1.9	2.1	2.2	2.4	2.6	2.8
Burkina Faso	3.4	4.9	5.8	6.9	7.7	8.2	8.8	9.5	10.4	4.0	4.9	5.8	6.9	7.7	8.2	8.8	9.5	10.4
Côte d'Ivoire	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2
Gambia	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6
Ghana	1.1	1.3	1.4	1.5	1.5	1.4	1.3	1.2	1.2	1.1	1.3	1.4	1.5	1.5	1.4	1.3	1.2	1.2
Guinea	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Guinea-Bissau	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	3.1	4.6	5.4	6.2	6.8	7.2	7.6	8.0	8.5	3.8	4.6	5.4	6.2	6.8	7.2	7.6	8.0	8.5
Niger	7.0	10.3	9.6	8.7	7.7	6.7	6.8	6.9	7.1	9.7	10.3	9.6	8.7	7.7	6.7	6.8	6.9	7.1
Nigeria	16.3	19.9	22.2	23.9	24.6	24.2	24.1	24.2	24.4	17.4	19.9	22.2	23.9	24.6	24.2	24.1	24.2	24.4
Senegal	0.9	1.4	1.7	2.0	2.4	2.5	2.7	2.9	3.2	1.2	1.4	1.7	2.0	2.4	2.5	2.7	2.9	3.2
Sierra Leone	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.1
Togo	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.9	0.4	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.9

1.5.3. VEGETABLE AND FRUIT ACREAGE

With the exception of Senegal, the production of vegetables and fruits in ECOWAS countries is unlikely to be affected in either the moderate or severe climate change scenarios, regardless of the prevailing SSP (see tables 9 and 10).

Table 9 Impact of climate change on vegetable and fruit acreage under RCP4.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-30.5	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 10 Impact of climate change on vegetable and fruits acreage under RCP8.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 11 Vegetable and fruits acreage without climate change (million ha)

	SSP1: Cash, Control & Calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4
Burkina Faso	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Côte d'Ivoire	1.8	2.2	2.6	3.2	3.7	4.3	4.9	5.1	5.4	1.8	2.2	2.6	3.2	3.7	4.3	4.9	5.1	5.4
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	2.0	2.4	3.0	3.6	4.3	5.2	6.0	6.1	6.3	2.0	2.4	3.0	3.6	4.3	5.2	6.0	6.1	6.3
Guinea	0.5	0.6	0.6	0.7	0.8	1.0	1.1	1.3	1.5	0.5	0.6	0.6	0.7	0.8	1.0	1.1	1.3	1.5
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Liberia	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.7
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Nigeria	10.8	12.3	13.8	15.4	16.7	18.2	19.7	20.9	22.3	10.8	12.3	13.8	15.4	16.7	18.2	19.7	20.9	22.3
Senegal	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sierra Leone	0.4	0.5	0.6	0.8	0.9	1.2	1.4	1.7	2.1	0.4	0.5	0.6	0.8	0.9	1.2	1.4	1.7	2.1
Togo	0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4
Burkina Faso	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1

Côte d'Ivoire	1.8	2.2	2.6	3.2	3.7	4.3	4.9	5.1	5.4	1.8	2.2	2.6	3.2	3.7	4.3	4.9	5.1	5.4
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	2.0	2.4	3.0	3.6	4.3	5.2	6.0	6.1	6.3	2.0	2.4	3.0	3.6	4.3	5.2	6.0	6.1	6.3
Guinea	0.5	0.6	0.6	0.7	0.8	1.0	1.1	1.3	1.5	0.5	0.6	0.6	0.7	0.8	1.0	1.1	1.3	1.5
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Liberia	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.6	0.7
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Nigeria	10.8	12.3	13.8	15.4	16.7	18.2	19.7	20.9	22.3	10.8	12.3	13.8	15.4	16.7	18.2	19.7	20.9	22.3
Senegal	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sierra Leone	0.4	0.5	0.6	0.8	0.9	1.2	1.4	1.7	2.1	0.4	0.5	0.6	0.8	0.9	1.2	1.4	1.7	2.1
Togo	0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6

1.5.4. OIL SEEDS ACREAGE

Oil seeds acreage is highly likely to be affected by climate change in both the moderate and severe climate change scenarios (see tables 12 and 13). Countries such as Benin, Côte d'Ivoire, Ghana, Guinea, Nigeria and Togo will first experience a decrease, then an increase and, finally, a decrease in the acreage of land allocated to oil seeds production by the end of the twenty-first century. Guinea-Bissau, Liberia and Sierra Leone will experience an increase in oil seeds acreage. In Burkina Faso, the Gambia, Mali, the Niger and Senegal, the amount of land allocated to oil seeds production is expected to decline from 2020 until the end of the century. Those trends are expected to be minimally affected by the prevailing climatic and socioeconomic conditions. Apart from Liberia and Sierra Leone, the change in oil seeds acreage in ECOWAS countries is expected to be between -73.2 per cent and 61.2 per cent under SSP1, SSP3 and SSP4, and between -90.2 per cent and 85.4 per cent for SSP2 under RCP4.5. The same pattern is observed under RCP8.5, except that the acreage of land allocated to oil seeds production is expected to decline earlier than under RCP4.5. The impacts of climate change also vary across ACZs. For example, climate change is likely to result in an increase in oil seeds acreage in ACZ 13 (loamy soils) and ACZ 27 (clay soils), and a decrease in oil seeds acreage in ACZ 20 and 22 (loamy soils) under SSP1 in both moderate and harsh climate change scenarios.

Table 12 Impact of climate change on oil seeds acreage under RCP4.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	-0.4	-0.3	15.3	47.2	84.7	0.0	0.0	0.0	0.0	-0.4	-0.3	15.3	47.5	85.4
Burkina Faso	0.0	0.0	0.0	0.0	-5.8	-2.6	-0.3	0.0	-3.3	0.0	0.0	-0.1	0.0	-4.1	-4.0	-10.8	-1.8	-1.0
Côte d'Ivoire	0.0	0.0	0.0	-1.6	-9.6	-39.0	-33.8	15.9	8.9	0.0	0.0	0.0	-1.6	-9.6	-39.0	-33.8	15.9	8.9
Gambia	0.0	0.0	0.0	-0.6	-1.1	-0.7	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.1	-0.7	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	-0.1	18.9	14.4	8.9	10.8	9.8	0.0	0.0	0.0	-0.1	18.9	14.4	8.9	10.8	9.8
Guinea	0.0	0.0	0.0	-0.3	6.3	7.3	31.0	61.2	29.7	0.0	0.0	0.0	-0.3	6.3	7.3	31.0	61.2	29.7
Guinea-Bissau	0.0	0.0	0.0	0.0	5.8	3.4	6.0	15.9	26.0	0.0	0.0	0.0	0.0	5.8	3.4	6.0	15.9	26.0
Liberia	0.0	0.0	0.0	0.0	213.7	559.1	861.7	1414.7	1200.4	0.0	0.0	0.0	0.0	213.7	559.1	861.7	1414.7	1200.4
Mali	0.0	0.0	0.0	-0.1	-25.4	-10.7	-0.8	0.0	-20.7	0.0	0.0	-0.9	-0.1	-25.8	-45.1	-69.6	-57.0	-46.3
Niger	0.0	0.0	0.0	0.0	-73.2	-2.4	0.0	0.0	-5.2	0.0	0.0	-2.4	0.0	-58.2	-85.3	-88.3	-90.2	-86.7
Nigeria	0.0	0.0	0.0	-1.6	-5.5	-6.4	2.6	11.7	-0.2	0.0	0.0	-0.1	-1.8	-4.4	-7.6	-12.2	15.6	8.4
Senegal	0.0	0.0	0.0	0.0	-3.7	-14.9	0.0	0.0	-32.6	0.0	0.0	0.0	0.0	-12.2	-3.2	-75.6	-6.2	-4.1
Sierra Leone	0.0	0.0	0.0	0.0	160.0	285.3	375.0	500.5	300.1	0.0	0.0	0.0	0.0	160.0	285.3	375.0	500.5	300.1
Togo	0.0	0.0	0.0	-0.1	-1.1	-2.1	6.2	24.2	40.9	0.0	0.0	0.0	-0.1	-1.1	-2.1	6.2	24.2	40.9
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	-0.4	-0.3	15.3	47.2	84.7	0.0	0.0	0.0	0.0	-0.4	-0.3	15.3	47.2	84.7
Burkina Faso	0.0	0.0	0.0	0.0	-5.8	-2.6	-0.3	0.0	-3.3	0.0	0.0	0.0	0.0	-5.8	-2.6	-0.3	-2.9	-3.3
Côte d'Ivoire	0.0	0.0	0.0	-1.6	-9.6	-39.0	-33.8	15.9	8.9	0.0	0.0	0.0	-1.6	-9.6	-39.0	-33.8	15.9	8.9
Gambia	0.0	0.0	0.0	-0.6	-1.1	-0.7	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-1.1	-0.7	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	-0.1	18.9	14.4	8.9	10.8	9.8	0.0	0.0	0.0	-0.1	18.9	14.4	8.9	10.8	9.8
Guinea	0.0	0.0	0.0	-0.3	6.3	7.3	31.0	61.2	29.7	0.0	0.0	0.0	-0.3	6.3	7.3	31.0	61.2	29.7
Guinea-Bissau	0.0	0.0	0.0	0.0	5.8	3.4	6.0	15.9	26.0	0.0	0.0	0.0	0.0	5.8	3.4	6.0	15.9	26.0
Liberia	0.0	0.0	0.0	0.0	213.7	559.1	861.7	1414.7	1200.4	0.0	0.0	0.0	0.0	213.7	559.1	861.7	1414.7	1200.4
Mali	0.0	0.0	0.0	-0.1	-25.4	-10.7	-0.8	0.0	-20.7	0.0	0.0	0.0	-0.1	-25.4	-10.7	-0.8	-16.9	-20.7

Niger	0.0	0.0	0.0	0.0	-73.2	-2.4	0.0	0.0	-5.2	0.0	0.0	0.0	0.0	-73.2	-2.4	0.0	-4.3	-5.2
Nigeria	0.0	0.0	0.0	-1.6	-5.5	-6.4	2.6	11.7	-0.2	0.0	0.0	0.0	-1.6	-5.5	-6.4	2.6	6.7	-0.2
Senegal	-0.3	0.0	0.0	0.0	-3.7	-14.9	0.0	0.0	-32.6	0.0	0.0	0.0	0.0	-3.7	-14.9	0.0	-26.4	-32.6
Sierra Leone	0.0	0.0	0.0	0.0	160.0	285.3	375.0	500.5	300.1	0.0	0.0	0.0	0.0	160.0	285.3	375.0	500.5	300.1
Togo	0.0	0.0	0.0	-0.1	-1.1	-2.1	6.2	24.2	40.9	0.0	0.0	0.0	-0.1	-1.1	-2.1	6.2	24.2	40.9

Table 13 Impact of climate change on oil seeds acreage under RCP8.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	-0.2	-0.2	-0.3	15.3	40.7	84.3	0.0	0.0	0.0	-0.2	-0.2	-0.3	15.3	41.0	85.4
Burkina Faso	0.0	0.0	0.0	-2.3	-5.5	-0.5	-0.3	-0.1	-6.8	0.0	-7.8	-0.1	-2.5	-3.8	-4.0	-10.8	-1.9	-1.0
Côte d'Ivoire	0.0	0.0	0.0	-1.6	12.2	-39.0	-33.8	-22.2	0.0	0.0	0.0	0.0	-1.6	12.2	-39.0	-33.8	-22.2	0.0
Gambia	0.0	0.0	0.0	-0.9	-1.1	0.0	0.0	0.0	-0.8	0.0	0.0	0.0	-0.9	-1.1	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	-0.1	19.2	14.4	8.9	9.7	3.2	0.0	0.0	0.0	-0.1	19.2	14.4	8.9	9.7	3.2
Guinea	0.0	0.0	0.0	-0.3	8.7	7.3	31.0	33.8	-0.1	0.0	0.0	0.0	-0.3	8.7	7.3	31.0	33.8	-0.1
Guinea-Bis-sau	0.0	0.0	0.0	0.0	5.8	3.4	6.0	13.8	26.0	0.0	0.0	0.0	0.0	5.8	3.4	6.0	13.8	26.0
Liberia	0.0	0.0	0.0	0.0	165.2	559.1	861.7	1414.7	0.0	0.0	0.0	0.0	0.0	165.2	559.1	861.7	1414.7	0.0
Mali	0.0	0.0	0.0	-3.5	-24.7	-1.2	-0.8	-0.3	-28.6	0.0	-34.3	-0.9	-5.9	-24.0	-45.1	-69.6	-58.5	-46.3
Niger	0.0	0.0	0.0	-1.1	-73.2	0.0	0.0	0.0	-7.7	0.0	-24.4	-2.4	-1.3	-58.2	-85.3	-88.3	-90.2	-86.7
Nigeria	0.0	0.0	0.0	-4.7	-1.1	-2.0	2.6	6.6	-15.5	0.0	-5.2	-0.1	-5.1	0.7	-5.6	-12.2	7.5	-0.1
Senegal	0.0	0.0	0.0	-2.8	-3.7	0.0	0.0	0.0	-38.7	0.0	-50.1	0.0	-8.2	-12.2	-3.2	-75.6	-6.2	-4.1
Sierra Leone	0.0	0.0	0.0	0.0	126.5	285.3	375.0	500.5	-0.4	0.0	0.0	0.0	0.0	126.5	285.3	375.0	500.5	-0.4
Togo	0.0	0.0	0.0	-0.1	0.0	-2.1	6.2	19.8	40.9	0.0	0.0	0.0	-0.1	0.0	-2.1	6.2	19.8	40.9
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	-0.2	-0.2	-0.3	15.3	40.7	84.3	0.0	0.0	0.0	-0.2	-0.2	-0.3	15.3	40.7	84.3

Burkina Faso	0.0	0.0	0.0	-2.3	-5.5	-0.5	-0.3	-0.1	-6.8	0.0	0.0	0.0	-2.3	-5.5	-2.6	-0.3	-0.1	-6.8
Côte d'Ivoire	0.0	0.0	0.0	-1.6	12.2	-39.0	-33.8	-22.2	0.0	0.0	0.0	0.0	-1.6	12.2	-39.0	-33.8	-22.2	0.0
Gambia	0.0	0.0	0.0	-0.9	-1.1	0.0	0.0	0.0	-0.8	0.0	0.0	0.0	-0.9	-1.1	0.0	0.0	0.0	-0.8
Ghana	0.0	0.0	0.0	-0.1	19.2	14.4	8.9	9.7	3.2	0.0	0.0	0.0	-0.1	19.2	14.4	8.9	9.7	3.2
Guinea	0.0	0.0	0.0	-0.3	8.7	7.3	31.0	33.8	-0.1	0.0	0.0	0.0	-0.3	8.7	7.3	31.0	33.8	-0.1
Guinea-Bissau	0.0	0.0	0.0	0.0	5.8	3.4	6.0	13.8	26.0	0.0	0.0	0.0	0.0	5.8	3.4	6.0	13.8	26.0
Liberia	0.0	0.0	0.0	0.0	165.2	559.1	861.7	1414.7	0.0	0.0	0.0	0.0	0.0	165.2	559.1	861.7	1414.7	0.0
Mali	0.0	0.0	0.0	-3.5	-24.7	-1.2	-0.8	-0.3	-28.6	0.0	0.0	0.0	-3.5	-24.7	-10.7	-0.8	-0.3	-28.6
Niger	0.0	0.0	0.0	-1.1	-73.2	0.0	0.0	0.0	-7.7	0.0	0.0	0.0	-1.1	-73.2	-2.4	0.0	0.0	-7.7
Nigeria	0.0	0.0	0.0	-4.7	-1.1	-2.0	2.6	6.6	-15.5	0.0	0.0	0.0	-4.7	-1.1	-4.7	2.6	6.6	-15.5
Senegal	-0.3	0.0	-0.5	-2.8	-3.7	0.0	0.0	0.0	-38.7	0.0	0.0	0.0	-2.8	-3.7	-14.9	0.0	0.0	-38.7
Sierra Leone	0.0	0.0	0.0	0.0	126.5	285.3	375.0	500.5	-0.4	0.0	0.0	0.0	0.0	126.5	285.3	375.0	500.5	-0.4
Togo	0.0	0.0	0.0	-0.1	0.0	-2.1	6.2	19.8	40.9	0.0	0.0	0.0	-0.1	0.0	-2.1	6.2	19.8	40.9

Table 14 Oil seeds acreage without climate change (thousand ha)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	6.5	7.9	9.6	11.8	14.3	17.3	18.3	17.4	14.5	6.5	7.9	9.6	11.8	14.3	17.3	18.3	17.3	14.4
Burkina Faso	4.6	5.6	6.9	8.2	9.8	11.6	13.4	15.7	16.6	4.6	5.6	6.3	7.5	8.5	10.3	13.1	13.0	13.7
Côte d'Ivoire	6.9	8.3	9.2	9.6	9.5	8.0	6.2	3.9	1.9	6.9	8.3	9.2	9.6	9.5	8.0	6.2	3.9	1.9
Gambia	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1
Ghana	6.5	7.9	8.7	8.1	7.1	6.5	5.8	5.0	3.8	6.5	7.9	8.7	8.1	7.1	6.5	5.8	5.0	3.8
Guinea	2.6	3.2	3.7	3.8	3.5	3.1	2.6	2.1	1.5	2.6	3.2	3.7	3.8	3.5	3.1	2.6	2.1	1.5
Guinea-Bissau	2.1	2.5	2.7	2.9	2.9	3.0	3.0	2.8	2.6	2.1	2.5	2.7	2.9	2.9	3.0	3.0	2.8	2.6

Liberia	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Mali	7.6	9.2	11.2	13.3	15.4	17.7	18.1	18.1	18.2	7.6	9.2	7.2	7.9	6.2	8.9	15.8	4.3	3.0
Niger	42.4	51.7	63.0	76.3	91.7	105.2	107.4	108.8	109.9	42.4	51.7	57.0	66.1	33.6	91.9	103.9	55.7	33.4
Nigeria	93.6	103.7	110.9	116.6	115.6	114.4	112.4	111.8	108.5	93.6	103.7	103.6	106.7	100.9	98.3	108.2	70.5	65.7
Senegal	8.1	9.8	12.0	14.3	16.9	19.9	20.6	20.6	20.5	8.1	9.8	4.9	4.8	4.4	4.3	16.3	1.4	1.2
Sierra Leone	1.6	2.0	2.3	2.7	1.2	1.0	0.9	0.8	0.8	1.6	2.0	2.3	2.7	1.2	1.0	0.9	0.8	0.8
Togo	3.0	3.7	4.3	4.8	5.4	5.6	5.4	4.9	4.2	3.0	3.7	4.3	4.8	5.4	5.6	5.4	4.9	4.2
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	6.5	7.9	9.6	11.8	14.3	17.3	18.3	17.4	14.5	6.5	7.9	9.6	11.8	14.3	17.3	18.3	17.4	14.5
Burkina Faso	4.6	5.6	6.9	8.2	9.8	11.6	13.4	15.7	16.6	4.6	5.6	6.9	8.2	9.8	11.6	13.4	15.7	16.6
Côte d'Ivoire	6.9	8.3	9.2	9.6	9.5	8.0	6.2	3.9	1.9	6.9	8.3	9.2	9.6	9.5	8.0	6.2	3.9	1.9
Gambia	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1
Ghana	6.5	7.9	8.7	8.1	7.1	6.5	5.8	5.0	3.8	6.5	7.9	8.7	8.1	7.1	6.5	5.8	5.0	3.8
Guinea	2.6	3.2	3.7	3.8	3.5	3.1	2.6	2.1	1.5	2.6	3.2	3.7	3.8	3.5	3.1	2.6	2.1	1.5
Guinea-Bissau	2.1	2.5	2.7	2.9	2.9	3.0	3.0	2.8	2.6	2.1	2.5	2.7	2.9	2.9	3.0	3.0	2.8	2.6
Liberia	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Mali	7.6	9.2	11.2	13.3	15.4	17.7	18.1	18.1	18.2	7.6	9.2	11.2	13.3	15.4	17.7	18.1	18.1	18.2
Niger	42.4	51.7	63.0	76.3	91.7	105.2	107.4	108.8	109.9	42.4	51.7	63.0	76.3	91.7	105.2	107.4	108.8	109.9
Nigeria	93.6	103.7	110.9	116.6	115.6	114.4	112.4	111.8	108.5	93.6	103.7	110.9	116.6	115.6	114.4	112.4	111.8	108.5
Senegal	8.1	9.8	12.0	14.3	16.9	19.9	20.6	20.6	20.5	8.1	9.8	12.0	14.3	16.9	19.9	20.6	20.6	20.5
Sierra Leone	1.6	2.0	2.3	2.7	1.2	1.0	0.9	0.8	0.8	1.6	2.0	2.3	2.7	1.2	1.0	0.9	0.8	0.8
Togo	3.0	3.7	4.3	4.8	5.4	5.6	5.4	4.9	4.2	3.0	3.7	4.3	4.8	5.4	5.6	5.4	4.9	4.2

1.5.5. SUGARCANE ACREAGE

As shown in tables 15 and 16, climate change is unlikely to have a significant impact for some years on sugarcane acreage in most ECOWAS countries. However, from 2070 until the end of the century, a number of countries, including Guinea, Guinea-Bissau and Sierra Leone are expected to experience a sharp increase in the acreage of land allocated to sugarcane production. Production is likely to increase by almost 70 per cent in Guinea-Bissau, for example. However, an increase of less than 10 per cent is foreseen in Guinea and Sierra Leone. The prevailing climatic and socioeconomic conditions are likely to have little impact on those trends. However, the RCP4.5 and RCP8.5 climate change scenarios have different impacts on sugarcane production in Senegal and Nigeria. In Nigeria, for example, the land acreage allocated to sugarcane production will first increase, then decrease and then increase once again towards the end of the century under RCP4.5, but will only increase (with no period of decline) under RCP8.5. Although sugarcane acreage in Senegal will not be affected by climate change under RCP4.5, it will experience a sharp decrease under RCP8.5, if that scenario is combined with SSP2, with sugarcane production declining by almost 24 per cent by 2090.

Table 15 Impact of climate change on sugarcane acreage under RCP4.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	115.3	0.0	0.0	0.0	333.2	373.2	404.3	427.6	0.0	115.3	0.0	0.0	0.0	333.2	373.2	404.3	427.6
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	115.3	0.0	0.0	0.0	333.2	373.2	404.3	427.6	0.0	115.3	0.0	0.0	0.0	333.2	373.2	404.3	427.6
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 16 Impact of climate change on sugarcane acreage under RCP8.5

	SSP1: Cash, control and calories									SSP2: Self-determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	333.2	373.2	404.3	0.0	0.0	0.0	0.0	0.0	0.0	333.2	373.2	404.3	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.8	0.0	-23.7	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SSP3: Civil society to the rescue?									SSP4: Save yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8	0.0	0.0	0.0	0.0	0.0	67.5	70.4	72.4	73.8
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	333.2	373.2	404.3	0.0	0.0	0.0	0.0	0.0	0.0	333.2	373.2	404.3	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1	0.0	0.0	0.0	0.0	0.0	4.8	4.9	5.0	5.1
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 17 Sugarcane acreage without climate change (thousand ha)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	2.6	3.2	3.9	4.8	5.8	7.1	8.7	10.6	12.9	2.6	3.2	3.9	4.8	5.8	7.1	8.7	10.6	12.9
Burkina Faso	5.0	6.1	7.4	9.0	11.0	13.4	15.2	16.5	18.2	5.0	6.1	7.4	9.0	11.0	13.4	15.2	16.5	18.2
Côte d'Ivoire	31.6	38.5	47.0	57.3	66.6	72.7	80.2	89.2	100.2	31.6	38.5	47.0	57.3	66.6	72.7	80.2	89.2	100.2
Ghana	7.6	9.2	11.2	13.7	16.2	18.6	20.0	20.5	21.2	7.6	9.2	11.2	13.7	16.2	18.6	20.0	20.5	21.2
Guinea	7.1	8.7	10.6	12.9	15.8	19.2	23.4	28.5	34.7	7.1	8.7	10.6	12.9	15.8	19.2	23.4	28.5	34.7
Guinea-Bissau	0.3	0.3	0.4	0.5	0.6	0.4	0.5	0.6	0.8	0.3	0.3	0.4	0.5	0.6	0.4	0.5	0.6	0.8
Liberia	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.8	1.0	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.8	1.0
Mali	6.1	7.5	9.1	11.1	13.5	16.5	20.1	24.5	29.9	6.1	7.5	9.1	11.1	13.5	16.5	20.1	24.5	29.9
Niger	5.2	6.4	7.8	9.4	11.5	14.0	17.1	20.9	25.4	5.2	6.4	7.8	9.4	11.5	14.0	17.1	20.9	25.4
Nigeria	39.5	33.4	32.3	32.4	33.9	36.7	40.9	46.8	54.5	39.5	33.4	32.3	32.4	33.9	36.7	40.9	46.8	54.5
Senegal	9.7	11.9	14.5	17.6	21.5	26.2	31.4	37.5	45.0	9.7	11.9	14.5	17.6	21.5	26.2	30.5	36.4	33.0
Sierra Leone	1.4	1.7	2.0	2.5	3.0	3.5	4.3	5.2	6.4	1.4	1.7	2.0	2.5	3.0	3.5	4.3	5.2	6.4
Togo	1.2	1.5	1.8	2.2	2.7	3.3	4.1	4.9	6.0	1.2	1.5	1.8	2.2	2.7	3.3	4.1	4.9	6.0
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	2.6	3.2	3.9	4.8	5.8	7.1	8.7	10.6	12.9	2.6	3.2	3.9	4.8	5.8	7.1	8.7	10.6	12.9
Burkina Faso	5.0	6.1	7.4	9.0	11.0	13.4	15.2	16.5	18.2	5.0	6.1	7.4	9.0	11.0	13.4	15.2	16.5	18.2
Côte d'Ivoire	31.6	38.5	47.0	57.3	66.6	72.7	80.2	89.2	100.2	31.6	38.5	47.0	57.3	66.6	72.7	80.2	89.2	100.2
Ghana	7.6	9.2	11.2	13.7	16.2	18.6	20.0	20.5	21.2	7.6	9.2	11.2	13.7	16.2	18.6	20.0	20.5	21.2
Guinea	7.1	8.7	10.6	12.9	15.8	19.2	23.4	28.5	34.7	7.1	8.7	10.6	12.9	15.8	19.2	23.4	28.5	34.7

Guinea-Bissau	0.3	0.3	0.4	0.5	0.6	0.4	0.5	0.6	0.8	0.3	0.3	0.4	0.5	0.6	0.4	0.5	0.6	0.8
Liberia	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.8	1.0	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.8	1.0
Mali	6.1	7.5	9.1	11.1	13.5	16.5	20.1	24.5	29.9	6.1	7.5	9.1	11.1	13.5	16.5	20.1	24.5	29.9
Niger	5.2	6.4	7.8	9.4	11.5	14.0	17.1	20.9	25.4	5.2	6.4	7.8	9.4	11.5	14.0	17.1	20.9	25.4
Nigeria	39.5	33.4	32.3	32.4	33.9	36.7	40.9	46.8	54.5	39.5	33.4	32.3	32.4	33.9	36.7	40.9	46.8	54.5
Senegal	9.7	11.9	14.5	17.6	21.5	26.2	31.4	37.5	45.0	9.7	11.9	14.5	17.6	21.5	26.2	31.4	37.5	45.0
Sierra Leone	1.4	1.7	2.0	2.5	3.0	3.5	4.3	5.2	6.4	1.4	1.7	2.0	2.5	3.0	3.5	4.3	5.2	6.4
Togo	1.2	1.5	1.8	2.2	2.7	3.3	4.1	4.9	6.0	1.2	1.5	1.8	2.2	2.7	3.3	4.1	4.9	6.0

1.5.6. COTTON ACREAGE

As shown in tables 18 and 19, climate change will, by the end of the century, cause an increase in cotton acreage in Benin, Ghana and Togo, cause a U-shaped trend in cotton acreage in Senegal, and an inverted U-shaped trend in cotton acreage in Guinea and Guinea-Bissau. Cotton acreage in the Gambia is expected to remain constant. In other countries, the impact of climate change on cotton acreage will depend on the prevailing climate and socioeconomic scenario. For example, Burkina-Faso will experience an increase in land allocated to cotton production by the end of the century under RCP4.5, but will experience a U-shaped trend under RCP8.5, irrespective of the prevailing socioeconomic scenario. The acreage of land allocated to cotton production in Mali, Niger and Nigeria is expected to remain constant or increase under RCP4.5, but will exhibit a U-shaped trend under RCP8.5, irrespective of the prevailing socioeconomic scenario. Cotton acreage is expected to decline only in Senegal under RCP4.5, although several countries, including Burkina Faso, Mali, the Niger, Nigeria and Senegal are expected to experience a decrease in cotton acreage under RCP8.5 over the same period. In general, the acreage of land allocated to cotton production may decline by as much as 20, 65 and 28 per cent for SSP1, SSP2 and SSP3, respectively, under RCP4.5, while it may decline by as much as 48, 65 and 48 per cent for SSP1, SSP2 and SSP3, respectively, under RCP8.5. Cotton acreage in all ECOWAS countries is expected to increase or reach a steady state by the end of the century, irrespective of the prevailing climatic and socioeconomic scenario.

The acreage of land under cotton cultivation is also expected to vary across ACZs in the different climatic and socioeconomic scenarios. It is expected to decrease in certain ACZs; in ACZ 17 (sandy soils) and ACZ 28 (loamy soils), for example, acreage is expected to decline by approximately 47 per cent by 2020 under RCP8.5 and SSP1.

Table 18 Impact of climate change on cotton acreage under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	43.8	229.0	175.5	83.2	0.0	0.0	0.0	0.0	0.0	43.8	229.0	175.5	83.2
Burkina Faso	0.0	0.0	0.0	0.0	0.0	45.9	59.0	31.4	31.9	0.0	-35.1	0.0	0.0	0.0	218.3	330.8	200.5	225.5
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	137.8	279.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	137.8	279.9	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	88.0	133.6	88.1	98.0	0.0	0.0	0.0	0.0	0.0	88.0	133.6	88.1	98.0
Guinea	0.0	0.0	0.0	0.0	0.0	57.0	119.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.0	119.8	0.0	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	11.2	250.7	197.4	0.0	0.0	0.0	0.0	0.0	0.0	11.2	250.7	197.4	0.0
Mali	0.0	0.0	0.0	0.0	0.0	51.7	71.2	28.4	29.0	0.0	-34.4	0.0	0.0	0.0	306.2	536.4	263.5	318.9
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	462.9	1023.8	75.1	81.7	0.0	-2.4	0.0	0.0	0.0	650.9	1696.7	148.1	197.8
Senegal	-20.0	0.0	0.0	0.0	0.0	1.3	1.4	1.4	2.0	-20.0	-25.2	0.0	0.0	0.0	5.4	6.8	8.3	9.9
Togo	0.0	0.0	0.0	0.0	0.0	30.3	49.5	45.6	45.0	0.0	0.0	0.0	0.0	0.0	30.3	49.5	45.6	45.0
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	43.8	229.0	175.5	83.2	0.0	0.0	0.0	0.0	0.0	43.8	229.0	175.5	83.2
Burkina Faso	0.0	0.0	0.0	0.0	0.0	45.9	59.0	31.4	31.9	0.0	0.0	0.0	0.0	0.0	45.9	59.0	31.4	31.9
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	137.8	279.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	137.8	279.9	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	88.0	133.6	88.1	98.0	0.0	0.0	0.0	0.0	0.0	88.0	133.6	88.1	98.0
Guinea	0.0	0.0	0.0	0.0	0.0	57.0	119.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.0	119.8	0.0	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	11.2	250.7	197.4	0.0	0.0	0.0	0.0	0.0	0.0	11.2	250.7	197.4	0.0
Mali	0.0	0.0	0.0	0.0	0.0	51.7	71.2	28.4	29.0	0.0	0.0	0.0	0.0	0.0	51.7	71.2	28.4	29.0
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	462.9	1023.8	75.1	81.7	0.0	0.0	0.0	0.0	0.0	462.9	1023.8	75.1	81.7
Senegal	-20.0	-27.4	0.0	0.0	0.0	1.3	1.4	1.4	2.0	0.0	0.0	0.0	0.0	0.0	1.3	1.4	1.4	2.0
Togo	0.0	0.0	0.0	0.0	0.0	30.3	49.5	45.6	45.0	0.0	0.0	0.0	0.0	0.0	30.3	49.5	45.6	45.0

Table 19 Impact of climate change on cotton acreage under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	28.3	43.8	224.4	235.6	83.2	0.0	0.0	0.0	0.0	28.3	43.8	224.4	235.6	83.2
Burkina Faso	-25.7	0.0	0.0	0.0	27.7	45.9	40.1	34.7	31.9	0.0	-35.1	0.0	0.0	108.1	218.3	224.6	221.9	225.5
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	137.8	93.5	39.9	0.0	0.0	0.0	0.0	0.0	0.0	137.8	93.5	39.9	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	54.2	88.0	95.5	98.1	98.0	0.0	0.0	0.0	0.0	54.2	88.0	95.5	98.1	98.0
Guinea	0.0	0.0	0.0	0.0	0.0	57.0	40.0	17.2	0.0	0.0	0.0	0.0	0.0	0.0	57.0	40.0	17.2	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	11.2	250.7	319.9	0.0	0.0	0.0	0.0	0.0	0.0	11.2	250.7	319.9	0.0
Mali	-25.2	0.0	0.0	0.0	24.8	51.7	42.2	33.5	29.0	0.0	-34.4	0.0	0.0	112.8	306.2	317.8	311.2	318.9
Niger	-47.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	-1.7	0.0	0.0	0.0	29.7	462.9	384.5	216.0	81.7	0.0	-2.4	0.0	0.0	37.7	650.9	637.2	425.9	197.8
Senegal	-31.8	0.0	0.0	0.0	1.2	1.3	1.4	1.4	2.0	-20.0	-25.2	0.0	0.0	4.6	5.4	6.8	8.4	9.9
Togo	0.0	0.0	0.0	0.0	24.0	30.3	44.5	51.1	45.0	0.0	0.0	0.0	0.0	24.0	30.3	44.5	51.1	45.0
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	28.3	43.8	224.4	235.6	83.2	0.0	0.0	0.0	0.0	28.3	43.8	224.4	235.6	83.2
Burkina Faso	-25.7	0.0	0.0	0.0	27.7	45.9	40.1	34.7	31.9	0.0	0.0	0.0	0.0	27.7	45.9	40.1	34.7	31.9
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	137.8	93.5	39.9	0.0	0.0	0.0	0.0	0.0	0.0	137.8	93.5	39.9	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	54.2	88.0	95.5	98.1	98.0	0.0	0.0	0.0	0.0	54.2	88.0	95.5	98.1	98.0
Guinea	0.0	0.0	0.0	0.0	0.0	57.0	40.0	17.2	0.0	0.0	0.0	0.0	0.0	0.0	57.0	40.0	17.2	0.0
Guinea-Bissau	0.0	0.0	0.0	0.0	0.0	11.2	250.7	319.9	0.0	0.0	0.0	0.0	0.0	0.0	11.2	250.7	319.9	0.0
Mali	-25.2	0.0	0.0	0.0	24.8	51.7	42.2	33.5	29.0	0.0	0.0	0.0	0.0	24.8	51.7	42.2	33.5	29.0
Niger	-47.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	-1.7	0.0	0.0	0.0	29.7	462.9	384.5	216.0	81.7	0.0	0.0	0.0	0.0	29.7	462.9	384.5	216.0	81.7
Senegal	-31.8	-27.4	0.0	0.0	1.2	1.3	1.4	1.4	2.0	0.0	0.0	0.0	0.0	1.2	1.3	1.4	1.4	2.0
Togo	0.0	0.0	0.0	0.0	24.0	30.3	44.5	51.1	45.0	0.0	0.0	0.0	0.0	24.0	30.3	44.5	51.1	45.0

Table 20 Cotton acreage without climate change (thousand ha)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	159.4	194.4	235.2	283.5	269.0	296.0	159.0	186.5	221.3	159.4	194.4	235.2	283.5	269.0	296.0	159.0	186.5	221.3
Burkina Faso	19.4	23.6	27.0	29.6	27.9	33.3	40.0	48.3	58.5	19.4	23.6	15.1	13.5	7.1	7.0	7.1	7.6	8.3
Côte d'Ivoire	353.6	431.0	395.0	237.0	258.3	289.8	295.6	294.2	295.5	353.6	431.0	395.0	237.0	258.3	289.8	295.6	294.2	295.5
Gambia	1.9	2.4	2.9	3.5	4.3	5.2	6.3	7.7	9.4	1.9	2.4	2.9	3.5	4.3	5.2	6.3	7.7	9.4
Ghana	34.3	41.8	46.8	49.3	38.4	44.7	46.1	48.3	51.3	34.3	41.8	46.8	49.3	38.4	44.7	46.1	48.3	51.3
Guinea	43.7	53.3	54.9	48.0	55.2	54.3	53.5	53.0	52.5	43.7	53.3	54.9	48.0	55.2	54.3	53.5	53.0	52.5
Guinea-Bissau	5.6	6.9	8.4	10.2	12.4	13.6	5.1	4.9	4.8	5.6	6.9	8.4	10.2	12.4	13.6	5.1	4.9	4.8
Mali	53.1	64.7	71.9	74.5	71.5	84.9	101.7	122.5	148.2	53.1	64.7	39.8	31.5	15.7	14.3	13.5	13.2	13.5
Niger	13.7	16.7	20.4	24.9	30.3	36.9	45.0	54.9	66.9	13.7	16.7	4.8	3.9	3.2	2.6	2.2	1.8	1.4
Nigeria	867.6	1057.6	907.0	389.2	296.4	277.4	252.5	251.8	260.5	867.6	1057.6	870.7	340.3	233.2	197.3	152.4	127.7	107.5
Senegal	59.8	72.9	88.9	108.3	130.4	158.9	189.7	222.0	198.2	59.8	46.4	33.9	34.5	34.8	37.8	38.3	38.3	39.0
Togo	161.6	197.0	236.3	280.8	275.3	327.8	326.6	339.2	355.1	161.6	197.0	236.3	280.8	275.3	327.8	326.6	339.2	355.1
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	159.4	194.4	235.2	283.5	269.0	296.0	159.0	186.5	221.3	159.4	194.4	235.2	283.5	269.0	296.0	159.0	186.5	221.3
Burkina Faso	19.4	23.6	27.0	29.6	27.9	33.3	40.0	48.3	58.5	19.4	23.6	27.0	29.6	27.9	33.3	40.0	48.3	58.5
Côte d'Ivoire	353.6	431.0	395.0	237.0	258.3	289.8	295.6	294.2	295.5	353.6	431.0	395.0	237.0	258.3	289.8	295.6	294.2	295.5
Gambia	1.9	2.4	2.9	3.5	4.3	5.2	6.3	7.7	9.4	1.9	2.4	2.9	3.5	4.3	5.2	6.3	7.7	9.4
Ghana	34.3	41.8	46.8	49.3	38.4	44.7	46.1	48.3	51.3	34.3	41.8	46.8	49.3	38.4	44.7	46.1	48.3	51.3
Guinea	43.7	53.3	54.9	48.0	55.2	54.3	53.5	53.0	52.5	43.7	53.3	54.9	48.0	55.2	54.3	53.5	53.0	52.5
Guinea-Bissau	5.6	6.9	8.4	10.2	12.4	13.6	5.1	4.9	4.8	5.6	6.9	8.4	10.2	12.4	13.6	5.1	4.9	4.8
Mali	53.1	64.7	71.9	74.5	71.5	84.9	101.7	122.5	148.2	53.1	64.7	71.9	74.5	71.5	84.9	101.7	122.5	148.2
Niger	13.7	16.7	20.4	24.9	30.3	36.9	45.0	54.9	66.9	13.7	16.7	20.4	24.9	30.3	36.9	45.0	54.9	66.9
Nigeria	867.6	1057.6	907.0	389.2	296.4	277.4	252.5	251.8	260.5	867.6	1057.6	907.0	389.2	296.4	277.4	252.5	251.8	260.5
Senegal	59.8	72.9	88.9	108.3	130.4	158.9	189.7	222.0	198.2	59.8	72.9	88.9	108.3	130.4	158.9	189.7	222.0	198.2
Togo	161.6	197.0	236.3	280.8	275.3	327.8	326.6	339.2	355.1	161.6	197.0	236.3	280.8	275.3	327.8	326.6	339.2	355.1

1.5.7. COCOA, COFFEE AND SESAME ACREAGE

Tables 21 and 22 show that neither moderate nor harsh climate change is expected to affect the acreage of land allocated to cocoa, coffee and sesame production, irrespective of the prevailing socioeconomic scenario.

Table 21 Impact of climate change on cocoa, coffee, and sesame acreage under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 22 Impact of climate change on cocoa, coffee and sesame acreage under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guinea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Togo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 23 Cocoa, coffee and sesame acreage without climate change (million ha)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	1.5	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.2	1.5	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.2
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	1.2	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.2	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Guinea	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	1.7	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.7	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Togo	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Burkina Faso	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Côte d'Ivoire	1.5	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.2	1.5	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.2
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana	1.2	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.2	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Guinea	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mali	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	1.7	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.7	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Senegal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sierra Leone	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Togo	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3

1.6. CLIMATE CHANGE IMPLICATIONS FOR CROP PRODUCTION

Except for rice, sugarcane and cotton, the crop production data, which refer to a group of crops, can function as an indicator of production.

1.6.1. PADDY RICE PRODUCTION

Except for the Niger and Senegal, paddy rice production is expected to decrease in most years in all ECOWAS countries, irrespective of the prevailing climatic and socioeconomic scenario (see tables 24 and 25). The predicted decreases are between 5 and 60 per cent and average 11 per cent under RCP4.5, and are between 2 and 40 per cent and average 8 per cent under RCP8.5. However, paddy rice production is expected to increase in both the Niger and Senegal in almost every year of the study period, irrespective of the prevailing climatic and socioeconomic scenario. The increase each year will largely depend on the prevailing climatic and socioeconomic scenarios.

The impact of climate change on paddy rice acreage is relatively consistent across ACZs. For example, ACZs 3 and 6 will experience an increase in paddy rice production between 2045 and 2060 in loamy soils under both moderate and harsh climate change if this occurs in tandem with the SSP1 scenario.

Table 24 Impact of climate change on paddy rice production under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-3.7	-8.0	-1.3	5.3	12.5	-1.3	-23.3	-11.6	-7.3	-3.7	-8.0	-1.3	5.3	12.5	-1.3	-23.3	-11.6	-7.3
Burkina Faso	-1.2	-2.9	1.3	6.9	18.4	6.3	-11.8	-5.3	-0.7	-1.2	-2.9	1.3	6.9	18.4	6.3	-11.8	-5.3	-0.7
Côte d'Ivoire	-5.4	-6.7	-0.9	5.5	3.1	-10.7	-61.0	-16.0	-9.0	-5.4	-6.7	-0.9	5.5	3.1	-10.7	-61.0	-16.0	-9.0
Gambia	-5.0	-10.1	-5.5	0.1	12.3	-3.4	-19.1	-10.8	-7.9	-5.0	-10.1	-5.5	0.1	12.3	-3.4	-19.1	-10.8	-7.9
Ghana	-7.6	-8.1	-1.4	4.0	-2.9	-17.2	-31.4	-20.9	-13.1	-7.6	-8.1	-1.4	4.0	-2.9	-17.2	-31.4	-20.9	-13.1
Guinea	-11.5	-8.5	-1.8	3.6	-4.6	-18.3	-32.0	-14.0	-10.9	-11.5	-8.5	-1.8	3.6	-4.6	-18.3	-32.0	-14.0	-10.9
Guinea-Bissau	-12.0	-11.9	-4.3	2.5	-7.0	-15.1	-24.7	-18.3	-13.9	-12.0	-11.9	-4.3	2.5	-7.0	-15.1	-24.7	-18.3	-13.9
Liberia	-14.0	-9.1	-2.9	1.7	-12.5	-27.7	-36.6	-17.4	-18.4	-14.0	-9.1	-2.9	1.7	-12.5	-27.7	-36.6	-17.4	-18.4
Mali	-0.3	-0.9	2.1	7.4	19.3	7.9	-12.7	-3.5	1.4	-0.3	-0.9	2.1	7.4	19.3	7.9	-12.7	-3.5	1.4
Niger	2.7	5.7	5.4	9.0	24.6	16.3	2.0	4.4	9.6	2.7	5.7	5.4	9.0	24.6	16.3	2.0	4.4	9.6
Nigeria	-7.4	-9.2	-1.3	4.9	0.9	-18.2	-50.9	-26.4	-15.3	-7.4	-9.2	-1.3	4.9	0.9	-18.2	-50.9	-26.4	-15.3
Senegal	2.6	0.7	1.5	5.4	14.2	9.0	-0.9	6.6	9.0	2.6	0.7	1.5	4.5	17.4	6.8	-7.6	-2.0	2.7
Sierra Leone	-14.4	-10.9	-3.6	1.4	-15.9	-36.6	-47.5	-42.5	-32.2	-14.4	-10.9	-3.6	1.4	-15.9	-36.6	-47.5	-42.5	-32.2
Togo	-5.6	-7.2	-0.8	5.8	9.0	-4.9	-30.7	-10.0	-7.0	-5.6	-7.2	-0.8	5.8	9.0	-4.9	-30.7	-10.0	-7.0
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-3.7	-8.0	-1.3	5.3	12.5	-1.3	-23.3	-11.6	-7.3	-3.7	-8.0	-1.3	5.3	12.5	-1.3	-23.3	-11.6	-7.3
Burkina Faso	-1.2	-2.9	1.3	6.9	18.4	6.3	-11.8	-5.3	-0.7	-1.2	-2.9	1.3	6.9	18.4	6.3	-11.8	-5.3	-0.7
Côte d'Ivoire	-5.4	-6.7	-0.9	5.5	3.1	-10.7	-61.0	-16.0	-9.0	-5.4	-6.7	-0.9	5.5	3.1	-10.7	-61.0	-16.0	-9.0
Gambia	-5.0	-10.1	-5.5	0.1	12.3	-3.4	-19.1	-10.8	-7.9	-5.0	-10.1	-5.5	0.1	12.3	-3.4	-19.1	-10.8	-7.9
Ghana	-7.6	-8.1	-1.4	4.0	-2.9	-17.2	-31.4	-20.9	-13.1	-7.6	-8.1	-1.4	4.0	-2.9	-17.2	-31.4	-20.9	-13.1
Guinea	-11.5	-8.5	-1.8	3.6	-4.6	-18.3	-32.0	-14.0	-10.9	-11.5	-8.5	-1.8	3.6	-4.6	-18.3	-32.0	-14.0	-10.9
Guinea-Bissau	-12.0	-11.9	-4.3	2.5	-7.0	-15.1	-24.7	-18.3	-13.9	-12.0	-11.9	-4.3	2.5	-7.0	-15.1	-24.7	-18.3	-13.9
Liberia	-14.0	-9.1	-2.9	1.7	-12.5	-27.7	-36.6	-17.4	-18.4	-14.0	-9.1	-2.9	1.7	-12.5	-27.7	-36.6	-17.4	-18.4
Mali	-0.3	-0.9	2.1	7.4	19.3	7.9	-12.7	-3.5	1.4	-0.3	-0.9	2.1	7.4	19.3	7.9	-12.7	-3.5	1.4
Niger	2.7	5.7	5.4	9.0	24.6	16.3	2.0	4.4	9.6	2.7	5.7	5.4	9.0	24.6	16.3	2.0	4.4	9.6
Nigeria	-7.4	-9.2	-1.3	4.9	0.9	-18.2	-50.9	-26.4	-15.3	-7.4	-9.2	-1.3	4.9	0.9	-18.2	-50.9	-26.4	-15.3
Senegal	2.6	0.7	1.5	5.4	14.2	9.0	-0.9	6.6	9.0	2.6	0.7	1.5	5.4	14.2	9.0	-0.9	6.6	9.0
Sierra Leone	-14.4	-10.9	-3.6	1.4	-15.9	-36.6	-47.5	-42.5	-32.2	-14.4	-10.9	-3.6	1.4	-15.9	-36.6	-47.5	-42.5	-32.2
Togo	-5.6	-7.2	-0.8	5.8	9.0	-4.9	-30.7	-10.0	-7.0	-5.6	-7.2	-0.8	5.8	9.0	-4.9	-30.7	-10.0	-7.0

Table 25 Impact of climate change on paddy rice production under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.2	0.6	5.2	14.9	16.4	3.7	-14.6	-8.8	0.3	-1.2	0.6	5.2	14.9	16.4	3.7	-14.6	-8.8	0.3
Burkina Faso	0.2	1.4	4.6	12.6	20.2	10.0	-6.0	-0.2	7.7	0.2	1.4	4.6	12.6	20.2	10.0	-6.0	-0.2	7.7
Côte d'Ivoire	-3.6	-0.2	6.0	12.5	10.9	-1.4	-17.7	-8.7	-0.8	-3.6	-0.2	6.0	12.5	10.9	-1.4	-17.7	-8.7	-0.8
Gambia	-2.5	-4.7	0.3	5.0	13.8	-1.8	-15.4	-6.2	1.9	-2.5	-4.7	0.3	5.0	13.8	-1.8	-15.4	-6.2	1.9
Ghana	-4.7	-3.1	2.3	5.6	2.7	-12.7	-23.4	-18.1	-2.0	-4.7	-3.1	2.3	5.6	2.7	-12.7	-23.4	-18.1	-2.0
Guinea	-8.5	-0.2	5.0	10.1	6.1	-6.7	-20.0	-8.6	4.7	-8.5	-0.2	5.0	10.1	6.1	-6.7	-20.0	-8.6	4.7
Guinea-Bissau	-6.7	-9.3	-2.2	-3.4	-4.6	-10.7	-15.6	-7.5	-1.0	-6.7	-9.3	-2.2	-3.4	-4.6	-10.7	-15.6	-7.5	-1.0
Liberia	-10.1	-1.4	2.9	4.4	-2.5	-18.2	-26.2	-12.7	12.4	-10.1	-1.4	2.9	4.4	-2.5	-18.2	-26.2	-12.7	12.4
Mali	0.6	1.3	4.5	11.3	20.7	11.7	-3.0	2.9	9.9	0.6	1.3	4.5	11.3	20.7	11.7	-3.0	2.9	9.9
Niger	2.1	0.7	3.3	6.6	23.5	18.6	8.3	14.3	19.3	2.1	0.7	3.3	6.6	23.5	18.6	8.3	14.3	19.3
Nigeria	-4.7	-1.6	4.4	9.6	7.6	-11.3	-26.5	-19.5	-1.2	-4.7	-1.6	4.4	9.6	7.6	-11.3	-26.5	-19.5	-1.2
Senegal	4.6	1.4	3.8	6.7	19.1	16.5	10.5	16.4	15.7	4.6	1.4	3.8	5.7	18.7	9.6	-1.9	5.8	12.2
Sierra Leone	-10.5	-5.1	0.7	0.2	-7.8	-30.4	-40.0	-39.0	-2.6	-10.5	-5.1	0.7	0.2	-7.8	-30.4	-40.0	-39.0	-2.6
Togo	-3.0	1.5	6.4	14.1	14.7	2.1	-15.3	-5.0	4.4	-3.0	1.5	6.4	14.1	14.7	2.1	-15.3	-5.0	4.4
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.2	0.6	5.2	14.9	16.4	3.7	-14.6	-8.8	0.3	-1.2	0.6	5.2	14.9	16.4	3.7	-14.6	-8.8	0.3
Burkina Faso	0.2	1.4	4.6	12.6	20.2	10.0	-6.0	-0.2	7.7	0.2	1.4	4.6	12.6	20.2	10.0	-6.0	-0.2	7.7
Côte d'Ivoire	-3.6	-0.2	6.0	12.5	10.9	-1.4	-17.7	-8.7	-0.8	-3.6	-0.2	6.0	12.5	10.9	-1.4	-17.7	-8.7	-0.8
Gambia	-2.5	-4.7	0.3	5.0	13.8	-1.8	-15.4	-6.2	1.9	-2.5	-4.7	0.3	5.0	13.8	-1.8	-15.4	-6.2	1.9
Ghana	-4.7	-3.1	2.3	5.6	2.7	-12.7	-23.4	-18.1	-2.0	-4.7	-3.1	2.3	5.6	2.7	-12.7	-23.4	-18.1	-2.0
Guinea	-8.5	-0.2	5.0	10.1	6.1	-6.7	-20.0	-8.6	4.7	-8.5	-0.2	5.0	10.1	6.1	-6.7	-20.0	-8.6	4.7
Guinea-Bissau	-6.7	-9.3	-2.2	-3.4	-4.6	-10.7	-15.6	-7.5	-1.0	-6.7	-9.3	-2.2	-3.4	-4.6	-10.7	-15.6	-7.5	-1.0
Liberia	-10.1	-1.4	2.9	4.4	-2.5	-18.2	-26.2	-12.7	12.4	-10.1	-1.4	2.9	4.4	-2.5	-18.2	-26.2	-12.7	12.4
Mali	0.6	1.3	4.5	11.3	20.7	11.7	-3.0	2.9	9.9	0.6	1.3	4.5	11.3	20.7	11.7	-3.0	2.9	9.9
Niger	2.1	0.7	3.3	6.6	23.5	18.6	8.3	14.3	19.3	2.1	0.7	3.3	6.6	23.5	18.6	8.3	14.3	19.3

Nigeria	-4.7	-1.6	4.4	9.6	7.6	-11.3	-26.5	-19.5	-1.2	-4.7	-1.6	4.4	9.6	7.6	-11.3	-26.5	-19.5	-1.2
Senegal	4.6	1.4	3.8	6.7	19.1	16.5	10.5	16.4	15.7	4.6	1.4	3.8	6.7	19.1	16.5	10.5	16.4	15.7
Sierra Leone	-10.5	-5.1	0.7	0.2	-7.8	-30.4	-40.0	-39.0	-2.6	-10.5	-5.1	0.7	0.2	-7.8	-30.4	-40.0	-39.0	-2.6
Togo	-3.0	1.5	6.4	14.1	14.7	2.1	-15.3	-5.0	4.4	-3.0	1.5	6.4	14.1	14.7	2.1	-15.3	-5.0	4.4

Table 26 Paddy rice production without climate change (100 thousand tons)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.6	0.7	0.9	1.1	1.4	1.9	2.7	3.7	5.1	0.6	0.7	0.9	1.1	1.4	1.9	2.7	3.7	5.1
Burkina Faso	1.1	1.4	1.9	2.5	3.4	4.8	6.7	9.5	13.2	1.1	1.4	1.9	2.5	3.4	4.8	6.7	9.5	13.2
Côte d'Ivoire	7.8	9.8	12.9	16.1	21.7	29.8	40.8	53.2	65.1	7.8	9.8	12.9	16.1	21.7	29.8	40.8	53.2	65.1
Gambia	0.1	0.2	0.2	0.3	0.4	0.5	0.8	1.0	1.2	0.1	0.2	0.2	0.3	0.4	0.5	0.8	1.0	1.2
Ghana	2.5	3.2	4.2	5.2	7.1	9.8	13.0	15.6	17.4	2.5	3.2	4.2	5.2	7.1	9.8	13.0	15.6	17.4
Guinea	14.7	18.6	24.5	32.9	45.0	60.5	75.9	86.1	96.5	14.7	18.6	24.5	32.9	45.0	60.5	75.9	86.1	96.5
Guinea-Bissau	1.4	1.8	2.4	3.2	4.2	5.3	6.5	7.7	8.9	1.4	1.8	2.4	3.2	4.2	5.3	6.5	7.7	8.9
Liberia	0.9	1.1	1.4	2.0	2.7	3.8	4.7	5.1	5.3	0.9	1.1	1.4	2.0	2.7	3.8	4.7	5.1	5.3
Mali	2.2	2.8	3.6	4.9	6.9	9.7	13.6	19.2	26.7	2.2	2.8	3.6	4.9	6.9	9.7	13.6	19.2	26.7
Niger	0.5	0.7	0.9	1.2	1.7	2.4	3.3	4.7	6.6	0.5	0.7	0.9	1.2	1.7	2.4	3.3	4.7	6.6
Nigeria	49.1	61.4	79.5	100.3	133.7	177.7	224.9	278.6	331.7	49.1	61.4	79.5	100.3	133.7	177.7	224.9	278.6	331.7
Senegal	2.4	3.0	4.0	5.4	7.5	10.5	14.9	20.4	27.7	2.4	3.0	4.0	2.9	3.9	5.3	7.2	9.4	12.2
Sierra Leone	7.5	9.5	12.5	17.1	23.9	31.8	35.6	36.6	35.4	7.5	9.5	12.5	17.1	23.9	31.8	35.6	36.6	35.4
Togo	0.7	0.9	1.2	1.6	2.1	3.0	4.1	5.5	7.2	0.7	0.9	1.2	1.6	2.1	3.0	4.1	5.5	7.2
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.6	0.7	0.9	1.1	1.4	1.9	2.7	3.7	5.1	0.6	0.7	0.9	1.1	1.4	1.9	2.7	3.7	5.1
Burkina Faso	1.1	1.4	1.9	2.5	3.4	4.8	6.7	9.5	13.2	1.1	1.4	1.9	2.5	3.4	4.8	6.7	9.5	13.2
Côte d'Ivoire	7.8	9.8	12.9	16.1	21.7	29.8	40.8	53.2	65.1	7.8	9.8	12.9	16.1	21.7	29.8	40.8	53.2	65.1
Gambia	0.1	0.2	0.2	0.3	0.4	0.5	0.8	1.0	1.2	0.1	0.2	0.2	0.3	0.4	0.5	0.8	1.0	1.2
Ghana	2.5	3.2	4.2	5.2	7.1	9.8	13.0	15.6	17.4	2.5	3.2	4.2	5.2	7.1	9.8	13.0	15.6	17.4
Guinea	14.7	18.6	24.5	32.9	45.0	60.5	75.9	86.1	96.5	14.7	18.6	24.5	32.9	45.0	60.5	75.9	86.1	96.5

Guinea-Bissau	1.4	1.8	2.4	3.2	4.2	5.3	6.5	7.7	8.9	1.4	1.8	2.4	3.2	4.2	5.3	6.5	7.7	8.9
Liberia	0.9	1.1	1.4	2.0	2.7	3.8	4.7	5.1	5.3	0.9	1.1	1.4	2.0	2.7	3.8	4.7	5.1	5.3
Mali	2.2	2.8	3.6	4.9	6.9	9.7	13.6	19.2	26.7	2.2	2.8	3.6	4.9	6.9	9.7	13.6	19.2	26.7
Niger	0.5	0.7	0.9	1.2	1.7	2.4	3.3	4.7	6.6	0.5	0.7	0.9	1.2	1.7	2.4	3.3	4.7	6.6
Nigeria	49.1	61.4	79.5	100.3	133.7	177.7	224.9	278.6	331.7	49.1	61.4	79.5	100.3	133.7	177.7	224.9	278.6	331.7
Senegal	2.4	3.0	4.0	5.4	7.5	10.5	14.9	20.4	27.7	2.4	3.0	4.0	5.4	7.5	10.5	14.9	20.4	27.7
Sierra Leone	7.5	9.5	12.5	17.1	23.9	31.8	35.6	36.6	35.4	7.5	9.5	12.5	17.1	23.9	31.8	35.6	36.6	35.4
Togo	0.7	0.9	1.2	1.6	2.1	3.0	4.1	5.5	7.2	0.7	0.9	1.2	1.6	2.1	3.0	4.1	5.5	7.2

1.6.2. MAIZE, SORGHUM AND MILLET PRODUCTION

Tables 27 and 28 show that climate change will negatively affect the production of maize, sorghum, and millet in all climatic and socioeconomic scenarios. Cereal production will decrease by between 0.3 and 95.8 per cent, with an average decline under RCP4.5 of 19.5, 20.1, 19.5 and 19.4 per cent in SSP1, SSP2, SSP3 and SSP4, respectively, while it will decrease by between 0.2 and 96.9 percent, with an average decline of 22.9, 23.0, 22.6, and 22.2 per cent under RCP8.5 in SSP1, SSP2, SSP3 and SSP4, respectively. However, climate change is likely to boost cereal production in some ECOWAS countries. For example, maize, sorghum and millet production in the Niger and Senegal is forecast to increase between 2020 and 2060 under RCP8.5, irrespective of which socioeconomic scenario becomes prevalent. During the first half of the century, Côte d'Ivoire, Guinea, Liberia and Sierra Leone are likely to experience a steeper decline in cereal production under RCP8.5 than under RCP4.5, while other countries are more negatively affected under RCP4.5 than under RCP8.5 After the mid-century, however, all countries are forecast to be less negatively affected under RCP4.5.

The impact of climate change on cereal production also varies across ACZs. Under SSP1, the production of maize, sorghum and millet will increase as a result of moderate climate change on loamy soils in ACZ 15 between 2020 and 2050 and in ACZ 22 between 2050 and 2060, with an estimated increase of some 743 per cent by 2060. Furthermore, an estimated increase in maize, sorghum and millet production of approximately 731 per cent is forecast between 2050 and 2065 for sandy soils in ACZ 30 under RCP8.5 and SSP1.

Table 27 Impact of climate change on cereal production under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-7.1	-5.4	-9.3	-5.0	-10.2	-28.8	-51.7	-61.7	-60.3	-7.1	-6.5	-9.3	-5.0	-10.2	-28.8	-51.7	-66.3	-69.4
Burkina Faso	-6.1	-5.1	-9.9	-4.9	-3.6	-18.4	-27.9	-20.6	-9.0	-4.1	-21.3	-10.0	-5.1	-4.4	-19.6	-28.3	-15.9	-9.2
Côte d'Ivoire	-5.4	-3.3	-5.8	-0.3	6.8	-44.4	-37.0	-36.0	-11.3	-5.4	-3.3	-5.8	-0.3	6.8	-44.4	-37.0	-36.0	-11.3
Gambia	-6.2	-5.2	-10.0	-5.0	-4.4	-18.6	-27.8	-20.4	-9.3	-6.5	-23.6	-10.0	-5.0	-4.4	-18.6	-27.8	-20.9	-9.7
Ghana	-7.4	-5.5	-9.1	-5.0	-20.2	-32.2	-37.1	-30.4	-18.4	-7.4	-5.5	-9.1	-5.0	-20.2	-32.2	-37.1	-30.5	-18.8
Guinea	-1.4	1.6	-0.7	0.0	-18.6	-27.5	-28.5	-91.4	-3.9	-1.4	1.6	-0.7	0.0	-18.6	-27.5	-28.5	-91.4	-3.9
Guinea-Bissau	-6.0	-4.3	-6.5	-8.4	-34.1	-39.4	-54.1	-64.5	-67.8	-6.0	-4.3	-6.5	-8.4	-34.1	-39.4	-54.1	-64.5	-67.8
Liberia	0.2	3.1	1.3	-0.5	-44.8	-26.4	-27.8	-95.8	-3.3	0.2	3.1	1.3	-0.5	-44.8	-26.4	-27.8	-95.8	-3.3
Mali	-2.6	-4.3	-9.2	-4.2	3.1	-15.0	-26.8	-19.6	-5.1	4.4	-18.4	-9.8	-4.8	-1.1	-19.9	-26.1	1.6	0.9
Niger	29.5	-1.7	-6.9	-2.7	93.3	-8.7	-22.5	-15.1	0.9	33.9	-8.0	-7.8	-3.6	6.9	-13.4	-18.2	54.1	27.5
Nigeria	-5.9	-4.9	-9.3	-3.2	-3.7	-20.5	-30.7	-23.5	-9.3	-4.6	-9.6	-9.5	-3.3	-4.4	-22.6	-30.1	-17.0	-9.4
Senegal	-2.7	-3.1	-8.0	-3.3	4.8	-1.5	-23.1	-15.8	12.3	11.1	-32.1	-9.0	-4.5	18.7	-16.7	-8.6	40.1	72.8
Sierra Leone	-1.6	0.4	-0.8	-3.0	-82.1	-42.7	-33.5	-78.6	-4.8	-1.6	0.4	-0.8	-3.0	-82.1	-42.7	-33.5	-78.6	-4.8
Togo	-8.2	-5.9	-10.0	-4.5	-9.7	-33.8	-49.0	-53.0	-48.1	-8.2	-5.9	-10.0	-4.5	-9.7	-33.8	-49.0	-53.0	-48.1
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-7.1	-5.4	-9.3	-5.0	-10.2	-28.8	-51.7	-61.7	-60.3	-7.1	-5.4	-9.3	-5.0	-10.2	-28.8	-51.7	-61.7	-60.3
Burkina Faso	-6.4	-5.1	-9.9	-4.9	-3.6	-18.4	-27.9	-20.6	-9.0	-6.1	-5.1	-9.9	-4.9	-3.6	-18.4	-27.9	-20.2	-9.0
Côte d'Ivoire	-5.4	-3.3	-5.8	-0.3	6.8	-44.4	-37.0	-36.0	-11.3	-5.4	-3.3	-5.8	-0.3	6.8	-44.4	-37.0	-36.0	-11.3
Gambia	-6.5	-5.2	-10.0	-5.0	-4.4	-18.6	-27.8	-20.4	-9.3	-6.2	-5.2	-10.0	-5.0	-4.4	-18.6	-27.8	-20.4	-9.3
Ghana	-7.4	-5.5	-9.1	-5.0	-20.2	-32.2	-37.1	-30.4	-18.4	-7.4	-5.5	-9.1	-5.0	-20.2	-32.2	-37.1	-30.4	-18.4
Guinea	-1.4	1.6	-0.7	0.0	-18.6	-27.5	-28.5	-91.4	-3.9	-1.4	1.6	-0.7	0.0	-18.6	-27.5	-28.5	-91.4	-3.9
Guinea-Bissau	-6.0	-4.3	-6.5	-8.4	-34.1	-39.4	-54.1	-64.5	-67.8	-6.0	-4.3	-6.5	-8.4	-34.1	-39.4	-54.1	-64.5	-67.8
Liberia	0.2	3.1	1.3	-0.5	-44.8	-26.4	-27.8	-95.8	-3.3	0.2	3.1	1.3	-0.5	-44.8	-26.4	-27.8	-95.8	-3.3
Mali	-2.8	-4.3	-9.2	-4.2	3.1	-15.0	-26.8	-19.6	-5.1	-4.6	-4.3	-9.2	-4.2	3.1	-15.0	-26.8	-16.3	-5.1
Niger	30.1	-1.7	-6.9	-2.7	93.3	-8.7	-22.5	-15.1	0.9	0.5	-1.7	-6.9	-2.7	93.3	-8.7	-22.5	-8.9	0.9
Nigeria	-6.5	-4.9	-9.3	-3.2	-3.7	-20.5	-30.7	-23.5	-9.3	-6.1	-4.9	-9.3	-3.2	-3.7	-20.5	-30.7	-21.7	-9.3
Senegal	-3.6	-3.1	-8.0	-3.3	4.8	-1.5	-23.1	-15.8	12.3	-2.2	-3.1	-8.0	-3.3	4.8	-1.5	-23.1	0.9	12.3
Sierra Leone	-1.6	0.4	-0.8	-3.0	-82.1	-42.7	-33.5	-78.6	-4.8	-1.6	0.4	-0.8	-3.0	-82.1	-42.7	-33.5	-78.6	-4.8
Togo	-8.2	-5.9	-10.0	-4.5	-9.7	-33.8	-49.0	-53.0	-48.1	-8.2	-5.9	-10.0	-4.5	-9.7	-33.8	-49.0	-53.0	-48.1

Table 28 Impact of climate change on cereal production under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-4.4	-2.8	-6.6	-5.9	-16.8	-30.6	-52.3	-61.8	-62.7	-4.4	-2.8	-6.6	-5.9	-16.8	-30.6	-52.3	-66.4	-71.6
Burkina Faso	-2.7	-1.0	-5.1	-3.7	-6.5	-20.6	-28.5	-20.7	-13.4	-0.7	-1.3	-5.4	-3.9	-7.7	-21.5	-29.1	-16.1	-16.2
Côte d'Ivoire	-4.9	-3.3	-5.4	-2.0	-44.7	-45.4	-38.0	-36.9	-31.1	-4.9	-3.3	-5.4	-2.0	-44.7	-45.4	-38.0	-36.9	-31.1
Gambia	-2.8	-0.8	-5.0	-3.7	-7.3	-20.6	-28.3	-20.2	-13.8	-3.3	-0.8	-5.0	-3.7	-7.3	-20.6	-28.3	-20.7	-15.9
Ghana	-5.7	-4.1	-7.2	-6.6	-25.3	-34.0	-38.0	-30.8	-23.4	-5.7	-4.1	-7.2	-6.6	-25.3	-34.0	-38.0	-30.9	-23.6
Guinea	-2.5	-2.7	-3.4	-3.6	-27.0	-26.9	-32.1	-91.5	-93.5	-2.5	-2.7	-3.4	-3.6	-27.0	-26.9	-32.1	-91.5	-93.5
Guinea-Bissau	-5.2	-3.9	-5.5	-7.7	-33.9	-39.9	-54.3	-65.5	-68.6	-5.2	-3.9	-5.5	-7.7	-33.9	-39.9	-54.3	-65.5	-68.6
Liberia	-1.8	-2.8	-2.7	-4.2	-45.5	-25.6	-31.7	-95.9	-96.9	-1.8	-2.8	-2.7	-4.2	-45.5	-25.6	-31.7	-95.9	-96.9
Mali	1.5	0.2	-4.1	-2.4	1.1	-19.2	-27.5	-20.4	-9.0	8.8	-0.9	-5.3	-3.3	-4.5	-21.8	-29.7	0.0	-8.7
Niger	39.2	5.5	0.6	1.3	98.7	-13.8	-22.6	-16.1	-0.2	43.0	3.8	-1.1	0.5	7.2	-14.7	-23.4	48.0	15.7
Nigeria	-3.6	-2.0	-5.6	-1.9	-9.7	-24.4	-31.4	-23.7	-10.7	-2.3	-2.3	-5.9	-2.1	-10.9	-25.4	-32.2	-17.4	-15.7
Senegal	2.5	2.9	-1.4	1.0	5.3	-14.6	-23.5	-17.1	9.9	17.4	1.4	-3.3	0.1	17.8	-18.2	-26.1	36.0	51.4
Sierra Leone	-3.2	-3.0	-3.0	-4.3	-82.3	-42.6	-36.4	-79.1	-82.8	-3.2	-3.0	-3.0	-4.3	-82.3	-42.6	-36.4	-79.1	-82.8
Togo	-6.1	-4.3	-7.8	-6.7	-21.9	-35.7	-50.0	-53.2	-53.0	-6.1	-4.3	-7.8	-6.7	-21.9	-35.7	-50.0	-53.2	-53.1
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-4.4	-2.8	-6.6	-5.9	-16.8	-30.6	-52.3	-61.8	-62.7	-4.4	-2.8	-6.6	-5.9	-16.8	-30.6	-52.3	-61.8	-62.7
Burkina Faso	-3.1	-1.0	-5.1	-3.7	-6.5	-20.6	-28.5	-20.7	-13.4	-2.6	-1.0	-5.1	-3.7	-6.5	-20.4	-28.5	-20.7	-13.4
Côte d'Ivoire	-4.9	-3.3	-5.4	-2.0	-44.7	-45.4	-38.0	-36.9	-31.1	-4.9	-3.3	-5.4	-2.0	-44.7	-45.4	-38.0	-36.9	-31.1
Gambia	-3.3	-0.8	-5.0	-3.7	-7.3	-20.6	-28.3	-20.2	-13.8	-2.8	-0.8	-5.0	-3.7	-7.3	-20.6	-28.3	-20.2	-13.8
Ghana	-5.7	-4.1	-7.2	-6.6	-25.3	-34.0	-38.0	-30.8	-23.4	-5.7	-4.1	-7.2	-6.6	-25.3	-34.0	-38.0	-30.8	-23.4
Guinea	-2.5	-2.7	-3.4	-3.6	-27.0	-26.9	-32.1	-91.5	-93.5	-2.5	-2.7	-3.4	-3.6	-27.0	-26.9	-32.1	-91.5	-93.5
Guinea-Bissau	-5.2	-3.9	-5.5	-7.7	-33.9	-39.9	-54.3	-65.5	-68.6	-5.2	-3.9	-5.5	-7.7	-33.9	-39.9	-54.3	-65.5	-68.6
Liberia	-1.8	-2.8	-2.7	-4.2	-45.5	-25.6	-31.7	-95.9	-96.9	-1.8	-2.8	-2.7	-4.2	-45.5	-25.6	-31.7	-95.9	-96.9
Mali	1.6	0.2	-4.1	-2.4	1.1	-19.2	-27.5	-20.4	-9.0	-0.4	0.2	-4.1	-2.4	1.1	-17.1	-27.5	-20.4	-9.0
Niger	40.4	5.5	0.6	1.3	98.7	-13.8	-22.6	-16.1	-0.2	7.2	5.5	0.6	1.3	98.7	-10.3	-22.6	-16.1	-0.2
Nigeria	-3.7	-2.0	-5.6	-1.9	-9.7	-24.4	-31.4	-23.7	-10.7	-3.8	-2.0	-5.6	-1.9	-9.7	-23.4	-31.4	-23.7	-10.7
Senegal	3.0	2.9	-1.4	1.0	5.3	-14.6	-23.5	-17.1	9.9	3.2	2.9	-1.4	1.0	5.3	-3.6	-23.5	-17.1	9.9
Sierra Leone	-3.2	-3.0	-3.0	-4.3	-82.3	-42.6	-36.4	-79.1	-82.8	-3.2	-3.0	-3.0	-4.3	-82.3	-42.6	-36.4	-79.1	-82.8
Togo	-6.1	-4.3	-7.8	-6.7	-21.9	-35.7	-50.0	-53.2	-53.0	-6.1	-4.3	-7.8	-6.7	-21.9	-35.7	-50.0	-53.2	-53.0

Table 29 Cereals production without climate change (100 thousand tons)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	14.9	18.2	22.7	28.7	36.4	44.7	55.8	70.3	88.7	14.8	18.2	22.7	28.7	36.4	44.7	55.8	63.6	75.3
Burkina Faso	42.6	54.5	71.0	93.7	118.1	145.5	180.5	224.7	281.4	37.4	52.9	68.6	90.2	113.0	138.5	172.3	175.0	85.8
Côte d'Ivoire	7.1	8.7	8.6	8.8	7.1	6.8	6.3	6.6	7.5	7.1	8.7	8.6	8.8	7.1	6.8	6.3	6.6	7.5
Gambia	2.5	3.1	4.0	5.4	6.9	8.5	10.7	13.6	17.3	2.2	3.1	4.0	5.4	6.9	8.5	10.7	10.6	4.4
Ghana	13.4	16.4	19.7	22.9	26.5	28.7	31.0	34.2	38.2	13.4	16.4	19.7	22.9	26.5	28.7	31.0	34.0	36.7
Guinea	1.5	1.9	2.4	3.1	3.7	4.3	5.7	7.8	10.6	1.5	1.9	2.4	3.1	3.7	4.3	5.7	7.8	10.6
Guinea-Bissau	1.1	1.4	1.6	1.9	2.2	2.5	2.8	3.2	3.8	1.1	1.4	1.6	1.9	2.2	2.5	2.8	3.2	3.8
Liberia	0.1	0.2	0.2	0.3	0.4	0.3	0.5	0.7	0.9	0.1	0.2	0.2	0.3	0.4	0.3	0.5	0.7	0.9
Mali	37.2	50.1	64.3	82.6	103.3	125.4	152.7	186.0	227.8	33.4	44.4	56.3	71.6	87.9	106.4	130.8	134.7	77.1
Niger	69.3	100.4	102.2	104.7	107.0	109.5	128.2	152.0	181.4	66.9	67.9	70.8	76.5	86.3	99.8	117.6	62.0	44.0
Nigeria	199.7	241.7	289.3	345.9	403.0	453.9	520.5	600.5	694.2	192.1	235.2	279.9	332.6	384.2	432.0	495.7	531.5	389.9
Senegal	10.9	15.0	19.5	25.5	34.0	40.8	51.2	65.2	83.6	8.8	12.0	14.7	18.4	23.6	30.3	39.7	41.2	20.5
Sierra Leone	1.2	1.5	2.0	2.7	3.7	1.2	1.2	1.4	1.8	1.2	1.5	2.0	2.7	3.7	1.2	1.2	1.4	1.8
Togo	5.4	6.8	8.9	11.4	14.1	16.6	19.6	23.3	27.6	5.4	6.8	8.9	11.4	14.1	16.6	19.6	23.3	27.6
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	14.8	18.2	22.7	28.7	36.4	44.7	55.8	70.3	88.7	14.9	18.2	22.7	28.7	36.4	44.7	55.8	70.3	88.7
Burkina Faso	37.5	54.5	71.0	93.7	118.1	145.5	180.5	224.7	281.4	43.5	54.5	71.0	93.7	118.1	145.5	180.5	224.7	281.4
Côte d'Ivoire	7.1	8.7	8.6	8.8	7.1	6.8	6.3	6.6	7.5	7.1	8.7	8.6	8.8	7.1	6.8	6.3	6.6	7.5
Gambia	2.2	3.1	4.0	5.4	6.9	8.5	10.7	13.6	17.3	2.5	3.1	4.0	5.4	6.9	8.5	10.7	13.6	17.3
Ghana	13.4	16.4	19.7	22.9	26.5	28.7	31.0	34.2	38.2	13.4	16.4	19.7	22.9	26.5	28.7	31.0	34.2	38.2
Guinea	1.5	1.9	2.4	3.1	3.7	4.3	5.7	7.8	10.6	1.5	1.9	2.4	3.1	3.7	4.3	5.7	7.8	10.6
Guinea-Bissau	1.1	1.4	1.6	1.9	2.2	2.5	2.8	3.2	3.8	1.1	1.4	1.6	1.9	2.2	2.5	2.8	3.2	3.8
Liberia	0.1	0.2	0.2	0.3	0.4	0.3	0.5	0.7	0.9	0.1	0.2	0.2	0.3	0.4	0.3	0.5	0.7	0.9
Mali	33.6	50.1	64.3	82.6	103.3	125.4	152.7	186.0	227.8	40.3	50.1	64.3	82.6	103.3	125.4	152.7	186.0	227.8
Niger	67.2	100.4	102.2	104.7	107.0	109.5	128.2	152.0	181.4	91.5	100.4	102.2	104.7	107.0	109.5	128.2	152.0	181.4
Nigeria	193.2	241.7	289.3	345.9	403.0	453.9	520.5	600.5	694.2	203.0	241.7	289.3	345.9	403.0	453.9	520.5	600.5	694.2
Senegal	8.9	15.0	19.5	25.5	34.0	40.8	51.2	65.2	83.6	12.1	15.0	19.5	25.5	34.0	40.8	51.2	65.2	83.6
Sierra Leone	1.2	1.5	2.0	2.7	3.7	1.2	1.2	1.4	1.8	1.2	1.5	2.0	2.7	3.7	1.2	1.2	1.4	1.8
Togo	5.4	6.8	8.9	11.4	14.1	16.6	19.6	23.3	27.6	5.4	6.8	8.9	11.4	14.1	16.6	19.6	23.3	27.6

1.6.3. PRODUCTION OF FRUITS AND VEGETABLES

Table 30 shows that the production of vegetables and fruits is expected to increase in all ECOWAS countries, with the exception of the Gambia, the Niger and Senegal, under the moderate climate change scenario, irrespective of the prevailing socioeconomic scenario. The expected increase in production ranges from 1.8 to 75.2 per cent, with an average of 26.0 per cent. Under RCP4.5, the production of vegetable and fruit in the Gambia, the Niger and Senegal decreases until 2060 or 2070, and will then increase until the end of the century. In those countries, the decline in vegetable and fruit production is predicted to be between 0.8 and 21.6 per cent, with an average decline of 6.4 percent, irrespective of the prevailing socioeconomic scenario. Similar trends occur under the harsh climate change scenario, but more countries will experience a decrease in their production of vegetables and fruits under that scenario. Benin, Burkina Faso, Mali, the Niger, Nigeria, Senegal and Togo will first experience a decrease in vegetable and fruit production of between 0.1 and 10.8 per cent, with an average of 3.8 per cent, and will then experience an increase in production of between 0.5 and 67.7 per cent, with an average increase of 29.9 per cent, until the end of the century, irrespective of the prevailing socioeconomic scenario. Other countries, including Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia and Sierra Leone will experience an increase in vegetable and fruits production of between 1.4 and 81.2 percent, with an average increase of 34.2 per cent, irrespective of the prevailing socioeconomic scenario.

The effect of climate change on vegetable and fruit production also varies across ACZs, and certain ACZs are expected to experience a decline in vegetable and fruit production under both moderate and harsh climate change scenarios. For example, ACZs 17, 19, and 20 are predicted to experience a decrease in vegetable and fruit production from 2020 to 2030 under SSP1 for both sandy and loamy soils.

Table 30 Impact of climate change on the production of vegetables and fruits under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	5.5	8.5	7.9	3.0	9.1	27.8	52.4	30.1	20.9	5.5	8.5	7.9	3.0	9.1	27.8	52.4	30.1	20.9
Burkina Faso	5.5	8.2	7.3	1.8	5.5	24.8	51.7	32.5	23.7	5.5	8.2	7.3	1.8	5.5	24.8	51.7	32.5	23.7
Côte d'Ivoire	8.8	11.3	11.9	12.1	25.1	43.0	63.8	37.9	29.7	8.8	11.3	11.9	12.1	25.1	43.0	63.8	37.9	29.7
Gambia	-2.9	-0.8	-2.9	-6.4	-12.0	9.1	35.3	27.6	25.8	-2.9	-0.8	-2.9	-6.4	-12.0	9.1	35.3	27.6	25.8
Ghana	9.2	11.1	11.8	12.9	27.9	45.2	64.0	37.1	28.0	9.2	11.1	11.8	12.9	27.9	45.2	64.0	37.1	28.0
Guinea	11.1	16.4	16.5	20.1	30.6	48.5	71.3	46.2	40.9	11.1	16.4	16.5	20.1	30.6	48.5	71.3	46.2	40.9
Guinea-Bissau	8.8	10.6	10.5	10.5	23.0	39.7	58.1	32.4	24.1	8.8	10.6	10.5	10.5	23.0	39.7	58.1	32.4	24.1
Liberia	13.3	18.5	23.4	31.9	46.4	56.2	75.2	48.4	45.6	13.3	18.5	23.4	31.9	46.4	56.2	75.2	48.4	45.6
Mali	4.0	7.0	6.3	2.0	2.4	22.4	47.9	31.4	23.7	4.0	7.0	6.3	2.0	2.4	22.4	47.9	31.4	23.7
Niger	-2.6	-6.0	0.2	-6.2	-21.6	-12.4	7.3	10.4	7.5	-2.6	-6.0	0.2	-6.2	-21.6	-12.4	7.3	10.4	7.5
Nigeria	2.0	6.1	5.0	3.5	5.0	25.7	51.3	34.0	28.4	2.0	6.1	5.0	3.5	5.0	25.7	51.3	34.0	28.4
Senegal	-1.9	-1.2	0.4	-3.8	-8.8	5.5	22.9	19.3	17.3	-1.9	-1.2	0.4	-3.8	-8.8	5.5	23.1	-7.5	24.0
Sierra Leone	14.5	19.0	20.9	31.0	47.3	59.0	74.6	45.6	42.8	14.5	19.0	20.9	31.0	47.3	59.0	74.6	45.6	42.8
Togo	6.9	10.4	10.4	7.4	15.1	34.8	61.6	38.8	31.7	6.9	10.4	10.4	7.4	15.1	34.8	61.6	38.8	31.7
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	5.5	8.5	7.9	3.0	9.1	27.8	52.4	30.1	20.9	5.5	8.5	7.9	3.0	9.1	27.8	52.4	30.1	20.9
Burkina Faso	5.5	8.2	7.3	1.8	5.5	24.8	51.7	32.5	23.7	5.5	8.2	7.3	1.8	5.5	24.8	51.7	32.5	23.7
Côte d'Ivoire	8.8	11.3	11.9	12.1	25.1	43.0	63.8	37.9	29.7	8.8	11.3	11.9	12.1	25.1	43.0	63.8	37.9	29.7
Gambia	-2.9	-0.8	-2.9	-6.4	-12.0	9.1	35.3	27.6	25.8	-2.9	-0.8	-2.9	-6.4	-12.0	9.1	35.3	27.6	25.8
Ghana	9.2	11.1	11.8	12.9	27.9	45.2	64.0	37.1	28.0	9.2	11.1	11.8	12.9	27.9	45.2	64.0	37.1	28.0
Guinea	11.1	16.4	16.5	20.1	30.6	48.5	71.3	46.2	40.9	11.1	16.4	16.5	20.1	30.6	48.5	71.3	46.2	40.9
Guinea-Bissau	8.8	10.6	10.5	10.5	23.0	39.7	58.1	32.4	24.1	8.8	10.6	10.5	10.5	23.0	39.7	58.1	32.4	24.1
Liberia	13.3	18.5	23.4	31.9	46.4	56.2	75.2	48.4	45.6	13.3	18.5	23.4	31.9	46.4	56.2	75.2	48.4	45.6
Mali	4.0	7.0	6.3	2.0	2.4	22.4	47.9	31.4	23.7	4.0	7.0	6.3	2.0	2.4	22.4	47.9	31.4	23.7
Niger	-2.6	-6.0	0.2	-6.2	-21.6	-12.4	7.3	10.4	7.5	-2.6	-6.0	0.2	-6.2	-21.6	-12.4	7.3	10.4	7.5
Nigeria	2.0	6.1	5.0	3.5	5.0	25.7	51.3	34.0	28.4	2.0	6.1	5.0	3.5	5.0	25.7	51.3	34.0	28.4
Senegal	-1.9	-1.2	0.4	-3.8	-8.8	5.5	22.9	19.3	17.3	-1.9	-1.2	0.4	-3.8	-8.8	5.5	22.9	19.3	17.3
Sierra Leone	14.5	19.0	20.9	31.0	47.3	59.0	74.6	45.6	42.8	14.5	19.0	20.9	31.0	47.3	59.0	74.6	45.6	42.8
Togo	6.9	10.4	10.4	7.4	15.1	34.8	61.6	38.8	31.7	6.9	10.4	10.4	7.4	15.1	34.8	61.6	38.8	31.7

Table 31 Impact of climate change on the production of vegetables and fruits under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.6	-0.1	-2.3	1.9	7.7	32.4	59.1	51.3	43.2	-1.6	-0.1	-2.3	1.9	7.7	32.4	59.1	51.3	43.2
Burkina Faso	-1.7	0.0	-1.7	1.0	4.6	29.3	59.0	52.3	42.6	-1.7	0.0	-1.7	1.0	4.6	29.3	59.0	52.3	42.6
Côte d'Ivoire	1.9	2.3	1.4	9.7	22.7	48.4	68.4	57.7	51.8	1.9	2.3	1.4	9.7	22.7	48.4	68.4	57.7	51.8
Gambia	-9.6	-5.9	-4.1	-2.0	-9.3	16.7	48.4	46.3	30.5	-9.6	-5.9	-4.1	-2.0	-9.3	16.7	48.4	46.3	30.5
Ghana	2.2	2.5	1.6	11.3	25.4	51.3	68.2	56.5	49.9	2.2	2.5	1.6	11.3	25.4	51.3	68.2	56.5	49.9
Guinea	5.6	7.9	7.6	15.2	28.6	55.0	80.0	68.3	62.4	5.6	7.9	7.6	15.2	28.6	55.0	80.0	68.3	62.4
Guinea-Bissau	1.4	1.6	-0.1	8.2	19.9	45.2	64.2	53.4	46.1	1.4	1.6	-0.1	8.2	19.9	45.2	64.2	53.4	46.1
Liberia	7.4	4.4	8.5	19.6	41.4	58.9	78.7	66.3	65.5	7.4	4.4	8.5	19.6	41.4	58.9	78.7	66.3	65.5
Mali	-1.8	0.3	-0.7	1.7	2.7	28.2	59.9	53.3	39.5	-1.8	0.3	-0.7	1.7	2.7	28.2	59.9	53.3	39.5
Niger	-4.9	-7.8	-2.3	-2.9	-10.8	0.5	17.9	18.2	14.9	-4.9	-7.8	-2.3	-2.9	-10.8	0.5	17.9	18.2	14.9
Nigeria	-3.7	0.0	-0.5	3.7	5.1	32.4	62.4	54.6	42.7	-3.7	0.0	-0.5	3.7	5.1	32.4	62.4	54.6	42.7
Senegal	-8.7	-4.5	-1.8	0.9	-8.0	8.6	28.3	25.5	20.0	-8.7	-4.5	-1.8	0.9	-8.0	8.6	28.5	25.7	24.4
Sierra Leone	8.8	7.3	7.0	20.8	41.0	64.2	81.2	67.3	62.2	8.8	7.3	7.0	20.8	41.0	64.2	81.2	67.3	62.2
Togo	-0.1	0.9	-0.3	4.9	13.9	39.0	67.7	60.0	54.5	-0.1	0.9	-0.3	4.9	13.9	39.0	67.7	60.0	54.5
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.6	-0.1	-2.3	1.9	7.7	32.4	59.1	51.3	43.2	-1.6	-0.1	-2.3	1.9	7.7	32.4	59.1	51.3	43.2
Burkina Faso	-1.7	0.0	-1.7	1.0	4.6	29.3	59.0	52.3	42.6	-1.7	0.0	-1.7	1.0	4.6	29.3	59.0	52.3	42.6
Côte d'Ivoire	1.9	2.3	1.4	9.7	22.7	48.4	68.4	57.7	51.8	1.9	2.3	1.4	9.7	22.7	48.4	68.4	57.7	51.8
Gambia	-9.6	-5.9	-4.1	-2.0	-9.3	16.7	48.4	46.3	30.5	-9.6	-5.9	-4.1	-2.0	-9.3	16.7	48.4	46.3	30.5
Ghana	2.2	2.5	1.6	11.3	25.4	51.3	68.2	56.5	49.9	2.2	2.5	1.6	11.3	25.4	51.3	68.2	56.5	49.9
Guinea	5.6	7.9	7.6	15.2	28.6	55.0	80.0	68.3	62.4	5.6	7.9	7.6	15.2	28.6	55.0	80.0	68.3	62.4
Guinea-Bissau	1.4	1.6	-0.1	8.2	19.9	45.2	64.2	53.4	46.1	1.4	1.6	-0.1	8.2	19.9	45.2	64.2	53.4	46.1
Liberia	7.4	4.4	8.5	19.6	41.4	58.9	78.7	66.3	65.5	7.4	4.4	8.5	19.6	41.4	58.9	78.7	66.3	65.5
Mali	-1.8	0.3	-0.7	1.7	2.7	28.2	59.9	53.3	39.5	-1.8	0.3	-0.7	1.7	2.7	28.2	59.9	53.3	39.5
Niger	-4.9	-7.8	-2.3	-2.9	-10.8	0.5	17.9	18.2	14.9	-4.9	-7.8	-2.3	-2.9	-10.8	0.5	17.9	18.2	14.9
Nigeria	-3.7	0.0	-0.5	3.7	5.1	32.4	62.4	54.6	42.7	-3.7	0.0	-0.5	3.7	5.1	32.4	62.4	54.6	42.7
Senegal	-8.7	-4.5	-1.8	0.9	-8.0	8.6	28.3	25.5	20.0	-8.7	-4.5	-1.8	0.9	-8.0	8.6	28.3	25.5	20.0
Sierra Leone	8.8	7.3	7.0	20.8	41.0	64.2	81.2	67.3	62.2	8.8	7.3	7.0	20.8	41.0	64.2	81.2	67.3	62.2
Togo	-0.1	0.9	-0.3	4.9	13.9	39.0	67.7	60.0	54.5	-0.1	0.9	-0.3	4.9	13.9	39.0	67.7	60.0	54.5

Table 32 The production of fruits and vegetables, without climate change (million tons)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	5.5	7.0	9.1	11.1	13.7	17.1	21.6	27.7	35.5	5.5	7.0	9.1	11.1	13.7	17.1	21.6	27.7	35.5
Burkina Faso	0.3	0.3	0.4	0.6	0.7	0.9	1.0	1.3	1.5	0.3	0.3	0.4	0.6	0.7	0.9	1.0	1.3	1.5
Côte d'Ivoire	14.2	18.0	23.8	32.4	42.6	56.8	73.5	88.9	107.7	14.2	18.0	23.8	32.4	42.6	56.8	73.5	88.9	107.7
Gambia	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3
Ghana	15.7	19.9	26.2	35.5	48.3	66.5	88.6	105.6	125.7	15.7	19.9	26.2	35.5	48.3	66.5	88.6	105.6	125.7
Guinea	3.6	4.6	5.5	6.9	8.9	11.8	15.7	21.1	28.4	3.6	4.6	5.5	6.9	8.9	11.8	15.7	21.1	28.4
Guinea-Bissau	0.2	0.2	0.3	0.4	0.6	0.8	1.2	1.6	2.2	0.2	0.2	0.3	0.4	0.6	0.8	1.2	1.6	2.2
Liberia	1.0	1.3	1.7	2.4	3.3	4.6	6.5	9.2	12.9	1.0	1.3	1.7	2.4	3.3	4.6	6.5	9.2	12.9
Mali	0.1	0.2	0.2	0.3	0.4	0.5	0.7	0.9	1.2	0.1	0.2	0.2	0.3	0.4	0.5	0.7	0.9	1.2
Niger	0.2	0.2	0.3	0.4	0.6	0.9	1.2	1.8	2.5	0.2	0.2	0.3	0.4	0.6	0.9	1.2	1.8	2.5
Nigeria	97.3	116.0	140.9	175.2	216.5	272.2	339.5	416.3	511.8	97.3	116.0	140.9	175.2	216.5	272.2	339.5	416.3	511.8
Senegal	0.9	1.0	1.2	1.4	1.7	2.0	2.5	3.1	3.8	0.9	1.0	1.2	1.4	1.7	2.0	2.5	3.0	2.5
Sierra Leone	3.1	3.9	5.2	7.1	9.9	13.9	19.7	27.7	38.9	3.1	3.9	5.2	7.1	9.9	13.9	19.7	27.7	38.9
Togo	2.2	2.8	3.6	4.3	5.3	6.6	8.3	10.5	13.4	2.2	2.8	3.6	4.3	5.3	6.6	8.3	10.5	13.4
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	5.5	7.0	9.1	11.1	13.7	17.1	21.6	27.7	35.5	5.5	7.0	9.1	11.1	13.7	17.1	21.6	27.7	35.5
Burkina Faso	0.3	0.3	0.4	0.6	0.7	0.9	1.0	1.3	1.5	0.3	0.3	0.4	0.6	0.7	0.9	1.0	1.3	1.5
Côte d'Ivoire	14.2	18.0	23.8	32.4	42.6	56.8	73.5	88.9	107.7	14.2	18.0	23.8	32.4	42.6	56.8	73.5	88.9	107.7
Gambia	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3
Ghana	15.7	19.9	26.2	35.5	48.3	66.5	88.6	105.6	125.7	15.7	19.9	26.2	35.5	48.3	66.5	88.6	105.6	125.7
Guinea	3.6	4.6	5.5	6.9	8.9	11.8	15.7	21.1	28.4	3.6	4.6	5.5	6.9	8.9	11.8	15.7	21.1	28.4
Guinea-Bissau	0.2	0.2	0.3	0.4	0.6	0.8	1.2	1.6	2.2	0.2	0.2	0.3	0.4	0.6	0.8	1.2	1.6	2.2
Liberia	1.0	1.3	1.7	2.4	3.3	4.6	6.5	9.2	12.9	1.0	1.3	1.7	2.4	3.3	4.6	6.5	9.2	12.9
Mali	0.1	0.2	0.2	0.3	0.4	0.5	0.7	0.9	1.2	0.1	0.2	0.2	0.3	0.4	0.5	0.7	0.9	1.2
Niger	0.2	0.2	0.3	0.4	0.6	0.9	1.2	1.8	2.5	0.2	0.2	0.3	0.4	0.6	0.9	1.2	1.8	2.5
Nigeria	97.3	116.0	140.9	175.2	216.5	272.2	339.5	416.3	511.8	97.3	116.0	140.9	175.2	216.5	272.2	339.5	416.3	511.8
Senegal	0.9	1.0	1.2	1.4	1.7	2.0	2.5	3.1	3.8	0.9	1.0	1.2	1.4	1.7	2.0	2.5	3.1	3.8
Sierra Leone	3.1	3.9	5.2	7.1	9.9	13.9	19.7	27.7	38.9	3.1	3.9	5.2	7.1	9.9	13.9	19.7	27.7	38.9
Togo	2.2	2.8	3.6	4.3	5.3	6.6	8.3	10.5	13.4	2.2	2.8	3.6	4.3	5.3	6.6	8.3	10.5	13.4

1.6.4. OIL SEEDS PRODUCTION

Both moderate and harsh climate change are expected to impede oil seeds production in all the countries for at least a number of years (see tables 23 and 24). Under the moderate climate change scenario, Burkina Faso, the Gambia, Mali, Nigeria and Senegal will experience a decrease in oil seeds production throughout the study period of between 3.5 and 81.6 per cent under SSP1, SSP3 and SSP4, with an average decrease of 18.7, 19.6 and 20.3 per cent, respectively, and between 2.9 and 92.6 per cent, with an average decrease of 24.6 per cent under SSP2. For those countries, a similar trend is observed under the harsh climate change scenario, but the expected decline would be between 0.7 and 81.7 per cent, with an average decline of approximately 22.5 percent for SSP1, SSP3 and SSP4, and between 0.7 and 92.9 per cent, with an average decline of 31.2 per cent for SSP2 under that climate change scenario. Oil seeds production in other countries, including Benin, Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia, Sierra Leone and Togo is expected to exhibit a U-shaped trend under the moderate climate change scenario, irrespective of the prevailing socioeconomic scenario; those countries will first experience a decrease in oil seeds production of between 0.5 and 39.2 per cent, with an average decrease of 7.6 per cent, and then an increase of between 1.4 and 82.3 per cent, with an average increase of 25.4 percent, with the exception of Liberia and Sierra Leone, which will experience an increase of more than 100 percent. The production of oil seeds in Benin, Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau and Togo is predicted to fluctuate between -38.1 per cent and 49.7 per cent, with an average of 0.73 per cent, under SSP1, SSP3 and SSP4, and between -38.1 per cent and 50.5 per cent, with an average of 0.75 per cent under SSP2 under the harsh climate change scenario.

The moderate and harsh climate change scenarios are also expected to have different impacts at the ACZ level. For example, oil seeds production rises at an exponential rate on clay soils in ACZ 27 under SSP1 from 2055 until the end of the century under RCP4.5, and until 2095 under RCP8.5, with a predicted increase of 1765.81 and 1791.17 per cent under RCP4.5 and RCP8.5, respectively.

Table 33 Impact of climate change on oil seeds production under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.4	-7.2	-6.5	-15.7	-17.8	-9.6	18.9	55.4	69.4	-1.4	-7.2	-6.5	-15.7	-17.8	-9.6	18.9	55.8	70.1
Burkina Faso	-5.2	-11.4	-8.6	-18.2	-30.4	-24.1	-11.1	-4.4	-16.4	-5.2	-11.4	-8.8	-18.3	-28.7	-23.8	-17.7	-2.9	-13.3
Côte d'Ivoire	-0.5	-2.3	-5.1	-13.9	-21.3	-39.2	-28.0	31.2	6.2	-0.5	-2.3	-5.1	-13.9	-21.3	-39.2	-28.0	31.2	6.2
Gambia	-6.2	-12.2	-8.4	-19.4	-25.5	-21.1	-9.1	-3.5	-13.8	-6.2	-12.2	-8.4	-19.4	-25.5	-21.1	-9.1	-3.4	-13.7
Ghana	-2.0	-0.9	-3.6	-7.8	7.3	15.3	15.1	18.7	1.4	-2.0	-0.9	-3.6	-7.8	7.3	15.3	15.1	18.7	1.4
Guinea	-2.0	-1.7	-3.7	-8.9	-3.0	10.9	45.7	82.3	24.1	-2.0	-1.7	-3.7	-8.9	-3.0	10.9	45.7	82.3	24.1
Guinea-Bissau	-2.9	-4.8	-5.0	-5.3	3.2	13.3	19.8	23.4	17.8	-2.9	-4.8	-5.0	-5.3	3.2	13.3	19.8	23.4	17.8
Liberia	-5.9	-3.1	-3.7	-3.7	204.9	614.2	952.4	1597.1	1164.5	-5.9	-3.1	-3.7	-3.7	204.9	614.2	952.4	1597.1	1164.5
Mali	-8.0	-12.9	-7.2	-17.1	-47.4	-38.1	-25.9	-21.1	-37.7	-8.0	-12.9	-8.4	-17.4	-45.6	-59.4	-74.4	-60.7	-54.6
Niger	-9.2	-13.5	-6.7	-16.9	-81.6	-34.2	-27.7	-24.1	-27.4	-9.2	-13.5	-9.0	-16.9	-70.6	-89.8	-91.0	-92.6	-89.9
Nigeria	-6.1	-10.7	-8.0	-18.0	-26.2	-24.4	-8.8	5.4	-14.8	-6.1	-10.7	-8.1	-18.1	-24.3	-23.3	-18.0	15.6	-5.3
Senegal	-8.7	-13.4	-7.1	-17	-32.6	-41.8	-26.5	-22.8	-47.7	-8.7	-13.4	-8.0	-17.6	-36.9	-29.5	-80.0	-23.3	-23.7
Sierra Leone	-5.8	-3.6	-3.9	-2.9	148.4	299.5	390.4	520.6	261.1	-5.8	-3.6	-3.9	-2.9	148.4	299.5	390.4	520.6	261.1
Togo	-1.5	-5.9	-4.8	-16	-16.6	-7.9	14.0	35.3	30.7	-1.5	-5.9	-4.8	-16	-16.6	-7.9	14.0	35.3	30.7
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.4	-7.2	-6.5	-15.7	-17.8	-9.6	18.9	55.4	69.4	-1.4	-7.2	-6.5	-15.7	-17.8	-9.6	18.9	55.4	69.4
Burkina Faso	-5.2	-11.4	-8.6	-18.2	-30.4	-24.1	-11.1	-4.4	-16.4	-5.2	-11.4	-8.6	-18.2	-30.4	-24.1	-11.1	-6.4	-16.4
Côte d'Ivoire	-0.5	-2.3	-5.1	-13.9	-21.3	-39.2	-28.0	31.2	6.2	-0.5	-2.3	-5.1	-13.9	-21.3	-39.2	-28.0	31.2	6.2
Gambia	-6.2	-12.2	-8.4	-19.4	-25.5	-21.1	-9.1	-3.5	-13.8	-6.2	-12.2	-8.4	-19.4	-25.5	-21.1	-9.1	-3.5	-13.8
Ghana	-2.0	-0.9	-3.6	-7.8	7.3	15.3	15.1	18.7	1.4	-2.0	-0.9	-3.6	-7.8	7.3	15.3	15.1	18.7	1.4
Guinea	-2.0	-1.7	-3.7	-8.9	-3.0	10.9	45.7	82.3	24.1	-2.0	-1.7	-3.7	-8.9	-3.0	10.9	45.7	82.3	24.1
Guinea-Bissau	-2.9	-4.8	-5.0	-5.3	3.2	13.3	19.8	23.4	17.8	-2.9	-4.8	-5.0	-5.3	3.2	13.3	19.8	23.4	17.8
Liberia	-5.9	-3.1	-3.7	-3.7	204.9	614.2	952.4	1597.1	1164.5	-5.9	-3.1	-3.7	-3.7	204.9	614.2	952.4	1597.1	1164.5
Mali	-8.0	-12.9	-7.2	-17.1	-47.4	-38.1	-25.9	-21.1	-37.7	-8.0	-12.9	-7.2	-17.1	-47.4	-38.1	-25.9	-33.5	-37.7
Niger	-9.2	-13.5	-6.7	-16.9	-81.6	-34.2	-27.7	-24.1	-27.4	-9.2	-13.5	-6.7	-16.9	-81.6	-34.2	-27.7	-27.2	-27.4
Nigeria	-6.1	-10.7	-8.0	-18.0	-26.2	-24.4	-8.8	5.4	-14.8	-6.1	-10.7	-8.0	-18.0	-26.2	-24.4	-8.8	1.9	-14.8
Senegal	-8.9	-13.4	-7.1	-17	-32.6	-41.8	-26.5	-22.8	-47.7	-8.7	-13.4	-7.1	-17	-32.6	-41.8	-26.5	-42.5	-47.7
Sierra Leone	-5.8	-3.6	-3.9	-2.9	148.4	299.5	390.4	520.6	261.1	-5.8	-3.6	-3.9	-2.9	148.4	299.5	390.4	520.6	261.1
Togo	-1.5	-5.9	-4.8	-16	-16.6	-7.9	14.0	35.3	30.7	-1.5	-5.9	-4.8	-16	-16.6	-7.9	14.0	35.3	30.7

Table 34 Impact of climate change on oil seeds production under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	2.0	-4.8	-9.9	-16.3	-14.7	-5.2	14.4	29.9	49.7	2.0	-4.8	-9.9	-16.3	-14.7	-5.2	14.4	30.3	50.5
Burkina Faso	-1.3	-10.9	-12.4	-21.0	-25.6	-19.4	-16.3	-21.1	-30.1	-1.3	-16.5	-12.0	-20.8	-23.1	-20.6	-23.0	-21.2	-25.3
Côte d'Ivoire	1.9	0.2	-7.1	-15.9	-0.8	-38.1	-28.6	-20.7	-10.0	1.9	0.2	-7.1	-15.9	-0.8	-38.1	-28.6	-20.7	-10.0
Gambia	-0.7	-8.9	-10.1	-19.8	-21.9	-17.1	-13.4	-18.7	-25.5	-0.7	-8.9	-10.1	-19.8	-21.9	-17.1	-13.4	-18.5	-24.9
Ghana	0.9	-1.7	-9.0	-15.6	8.9	16.2	13.4	4.2	-14.9	0.9	-1.7	-9.0	-15.6	8.9	16.2	13.4	4.2	-14.9
Guinea	0.9	-0.7	-8.4	-14.8	0.1	13.4	45.8	38.7	-9.4	0.9	-0.7	-8.4	-14.8	0.1	13.4	45.8	38.7	-9.4
Guinea-Bissau	2.1	-3.4	-11.2	-17.6	-3.8	12.8	22.3	23.2	14.1	2.1	-3.4	-11.2	-17.6	-3.8	12.8	22.3	23.2	14.1
Liberia	0.0	2.4	-4.7	-9.6	161.3	654.6	1032.7	1590.3	-2.8	0.0	2.4	-4.7	-9.6	161.3	654.6	1032.7	1590.3	-2.8
Mali	-10.2	-19.9	-15.9	-25.1	-46.8	-28.5	-27.6	-26.6	-50.2	-10.2	-45.7	-15.7	-26.2	-42.6	-57.9	-75.5	-67.1	-60.1
Niger	-12.8	-23.0	-17.4	-24.0	-81.7	-29.1	-28.9	-27.0	-36.5	-12.8	-41.4	-19.3	-24.1	-70.6	-89.3	-91.3	-92.9	-90.9
Nigeria	-2.3	-9.9	-11.6	-22.8	-20.4	-18.2	-10.6	-11.6	-35.9	-2.3	-13.6	-11.2	-22.8	-17.5	-18.8	-19.7	-5.6	-23.0
Senegal	-11.5	-21.7	-16.8	-25.0	-33.3	-28.3	-28.0	-26.8	-57.7	-11.5	-59.7	-15.5	-28.4	-35.8	-26.7	-80.8	-29.9	-32.5
Sierra Leone	-0.4	0.6	-6.3	-10.8	115.2	316.7	423.4	519.7	-6.0	-0.4	0.6	-6.3	-10.8	115.2	316.7	423.4	519.7	-6.0
Togo	1.6	-1.3	-7.2	-14.9	-13.1	-2.8	10.4	17.3	17.2	1.6	-1.3	-7.2	-14.9	-13.1	-2.8	10.4	17.3	17.2
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	2.0	-4.8	-9.9	-16.3	-14.7	-5.2	14.4	29.9	49.7	2.0	-4.8	-9.9	-16.3	-14.7	-5.2	14.4	29.9	49.7
Burkina Faso	-1.3	-10.9	-12.4	-21.0	-25.6	-19.4	-16.3	-21.1	-30.1	-1.3	-10.9	-12.4	-21.0	-25.6	-20.8	-16.3	-21.1	-30.1
Côte d'Ivoire	1.9	0.2	-7.1	-15.9	-0.8	-38.1	-28.6	-20.7	-10.0	1.9	0.2	-7.1	-15.9	-0.8	-38.1	-28.6	-20.7	-10.0
Gambia	-0.7	-8.9	-10.1	-19.8	-21.9	-17.1	-13.4	-18.7	-25.5	-0.7	-8.9	-10.1	-19.8	-21.9	-17.1	-13.4	-18.7	-25.5
Ghana	0.9	-1.7	-9.0	-15.6	8.9	16.2	13.4	4.2	-14.9	0.9	-1.7	-9.0	-15.6	8.9	16.2	13.4	4.2	-14.9
Guinea	0.9	-0.7	-8.4	-14.8	0.1	13.4	45.8	38.7	-9.4	0.9	-0.7	-8.4	-14.8	0.1	13.4	45.8	38.7	-9.4
Guinea-Bissau	2.1	-3.4	-11.2	-17.6	-3.8	12.8	22.3	23.2	14.1	2.1	-3.4	-11.2	-17.6	-3.8	12.8	22.3	23.2	14.1
Liberia	0.0	2.4	-4.7	-9.6	161.3	654.6	1032.7	1590.3	-2.8	0.0	2.4	-4.7	-9.6	161.3	654.6	1032.7	1590.3	-2.8
Mali	-10.2	-19.9	-15.9	-25.1	-46.8	-28.5	-27.6	-26.6	-50.2	-10.2	-19.9	-15.9	-25.1	-46.8	-35.1	-27.6	-26.6	-50.2
Niger	-12.8	-23.0	-17.4	-24.0	-81.7	-29.1	-28.9	-27.0	-36.5	-12.8	-23.0	-17.4	-24.0	-81.7	-30.7	-28.9	-27.0	-36.5
Nigeria	-2.3	-9.9	-11.6	-22.8	-20.4	-18.2	-10.6	-11.6	-35.9	-2.3	-9.9	-11.6	-22.8	-20.4	-20.0	-10.6	-11.6	-35.9
Senegal	-11.7	-21.7	-17.1	-25.0	-33.3	-28.3	-28.0	-26.8	-57.7	-11.5	-21.7	-16.8	-25.0	-33.3	-38.8	-28.0	-26.8	-57.7
Sierra Leone	-0.4	0.6	-6.3	-10.8	115.2	316.7	423.4	519.7	-6.0	-0.4	0.6	-6.3	-10.8	115.2	316.7	423.4	519.7	-6.0
Togo	1.6	-1.3	-7.2	-14.9	-13.1	-2.8	10.4	17.3	17.2	1.6	-1.3	-7.2	-14.9	-13.1	-2.8	10.4	17.3	17.2

Table 35 Oil seeds production without climate change (100 thousand tons)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	5.0	6.4	8.4	11.4	15.9	22.2	27.2	30.3	29.5	5.0	6.4	8.4	11.4	15.9	22.2	27.2	30.1	29.2
Burkina Faso	3.6	4.5	6.0	8.0	10.9	14.9	20.2	27.2	33.2	3.6	4.5	5.5	7.3	9.6	13.4	19.7	22.8	27.9
Côte d'Ivoire	5.6	7.0	8.5	9.9	11.4	11.1	9.9	7.2	4.2	5.6	7.0	8.5	9.9	11.4	11.1	9.9	7.2	4.2
Gambia	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.3	0.5	0.6	0.7	0.8	1.0	1.2	1.5	1.9	2.3
Ghana	5.1	6.4	7.7	7.9	7.9	8.4	8.7	8.7	7.6	5.1	6.4	7.7	7.9	7.9	8.4	8.7	8.7	7.6
Guinea	2.1	2.7	3.4	3.9	4.1	4.2	4.2	3.9	3.2	2.1	2.7	3.4	3.9	4.1	4.2	4.2	3.9	3.2
Guinea-Bissau	1.7	2.1	2.5	3.0	3.4	4.2	4.7	5.2	5.5	1.7	2.1	2.5	3.0	3.4	4.2	4.7	5.2	5.5
Liberia	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Mali	5.6	7.1	9.3	12.4	16.4	21.6	25.6	29.8	34.3	5.6	7.1	6.1	7.4	6.7	11.2	22.4	7.3	6.0
Niger	31.7	40.2	53.2	72.2	99.0	131.1	155.4	181.8	211.1	31.7	40.2	48.3	62.8	36.3	115.1	150.5	93.7	64.6
Nigeria	75.4	86.4	99.6	116.6	131.7	149.2	169.1	193.7	216.0	75.4	86.4	93.6	107.6	116.3	129.9	163.2	126.6	135.8
Senegal	5.9	7.4	9.8	13.1	17.6	24.0	28.6	33.1	38.0	5.9	7.4	4.0	4.4	4.7	5.3	22.8	2.3	2.2
Sierra Leone	1.3	1.6	2.1	2.7	1.5	1.4	1.5	1.6	1.7	1.3	1.6	2.1	2.7	1.5	1.4	1.5	1.6	1.7
Togo	2.6	3.3	4.1	5.2	6.7	7.9	8.9	9.4	9.6	2.6	3.3	4.1	5.2	6.7	7.9	8.9	9.4	9.6
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	5.0	6.4	8.4	11.4	15.9	22.2	27.2	30.3	29.5	5.0	6.4	8.4	11.4	15.9	22.2	27.2	30.3	29.5
Burkina Faso	3.6	4.5	6.0	8.0	10.9	14.9	20.2	27.2	33.2	3.6	4.5	6.0	8.0	10.9	14.9	20.2	27.2	33.2
Côte d'Ivoire	5.6	7.0	8.5	9.9	11.4	11.1	9.9	7.2	4.2	5.6	7.0	8.5	9.9	11.4	11.1	9.9	7.2	4.2
Gambia	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.3	0.5	0.6	0.7	0.8	1.0	1.2	1.5	2.0	2.3
Ghana	5.1	6.4	7.7	7.9	7.9	8.4	8.7	8.7	7.6	5.1	6.4	7.7	7.9	7.9	8.4	8.7	8.7	7.6
Guinea	2.1	2.7	3.4	3.9	4.1	4.2	4.2	3.9	3.2	2.1	2.7	3.4	3.9	4.1	4.2	4.2	3.9	3.2
Guinea-Bissau	1.7	2.1	2.5	3.0	3.4	4.2	4.7	5.2	5.5	1.7	2.1	2.5	3.0	3.4	4.2	4.7	5.2	5.5
Liberia	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Mali	5.6	7.1	9.3	12.4	16.4	21.6	25.6	29.8	34.3	5.6	7.1	9.3	12.4	16.4	21.6	25.6	29.8	34.3
Niger	31.7	40.2	53.2	72.2	99.0	131.1	155.4	181.8	211.1	31.7	40.2	53.2	72.2	99.0	131.1	155.4	181.8	211.1
Nigeria	75.4	86.4	99.6	116.6	131.7	149.2	169.1	193.7	216.0	75.4	86.4	99.6	116.6	131.7	149.2	169.1	193.7	216.0
Senegal	5.9	7.4	9.8	13.1	17.6	24.0	28.6	33.1	38.0	5.9	7.4	9.8	13.1	17.6	24.0	28.6	33.1	38.0
Sierra Leone	1.3	1.6	2.1	2.7	1.5	1.4	1.5	1.6	1.7	1.3	1.6	2.1	2.7	1.5	1.4	1.5	1.6	1.7
Togo	2.6	3.3	4.1	5.2	6.7	7.9	8.9	9.4	9.6	2.6	3.3	4.1	5.2	6.7	7.9	8.9	9.4	9.6

1.6.5. SUGARCANE PRODUCTION

Tables 36 and 37 show that sugarcane production increases in most of years under both moderate and harsh climate change scenarios in all ECOWAS countries with the exception of Liberia and Sierra Leone, irrespective of the prevailing socioeconomic scenario. Except for Guinea-Bissau, Liberia, Nigeria, Siera Leone., the expected increase in sugarcane production ranges between 0.5 and 78.7 percent with an average increase of 22.8 per cent under RCP4.5, and between 1.3 and 64.2 per cent, with an average increase of 26.4 per cent under SSP1, SSP3 and SSP44, and an average of 27.0 per cent under SSP2 under RCP8.5. The predicted increase in sugarcane production in Guinea-Bissau and Nigeria exceeds 100 per cent in certain years under certain climatic and socioeconomic scenarios. Liberia and Sierra Leone will experience a decrease in sugarcane production until 2060, and thereafter sugarcane production will increase until 2095 under both moderate and harsh climate change, irrespective of the prevailing socioeconomic scenario. A U-shaped trend, with the change in sugarcane production ranging between -17.1 per cent and 31.1 per cent is expected under the moderate climate change scenario, and between -13.4 per cent and 23.2 per cent under the harsh climate change scenario.

The impact of climate change on sugarcane production remains consistent across ACZs. For example, on loamy soils in ACZ 9, sugarcane production will decrease in almost all years under both moderate and harsh climate change when this occurs in tandem with the SSP1 scenario.

Table 36 Impact of climate change on sugarcane production under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	2.1	13.4	5.3	15.0	23.0	40.1	21.6	20.4	24.4	2.1	13.4	5.3	15.0	23.0	40.1	21.6	20.4	24.4
Burkina Faso	9.7	17.9	6.4	14.5	48.1	57.3	43.1	36.9	26.5	9.7	17.9	6.4	14.5	48.1	57.3	43.1	36.9	26.5
Côte d'Ivoire	-2.0	7.0	1.1	9.1	16.7	31.6	14.0	12.6	11.6	-2.0	7.0	1.1	9.1	16.7	31.6	14.0	12.6	11.6
Ghana	0.5	11.8	4.1	12.0	22.6	36.0	16.3	14.4	14.1	0.5	11.8	4.1	12.0	22.6	36.0	16.3	14.4	14.1
Guinea	-3.1	3.8	-2.7	3.7	11.3	28.1	11.9	11.2	9.4	-3.1	3.8	-2.7	3.7	11.3	28.1	11.9	11.2	9.4
Guinea-Bissau	2.9	14.0	9.3	19.9	35.2	130.2	106.7	99.6	94.8	2.9	14.0	9.3	19.9	35.2	130.2	106.7	99.6	94.8
Liberia	-17.1	-12.7	-10.4	-8.2	-6.8	23.5	5.4	3.4	-3.6	-17.1	-12.7	-10.4	-8.2	-6.8	23.5	5.4	3.4	-3.6
Mali	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2
Niger	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2
Nigeria	11.2	120.4	5.3	14.8	60.4	360.5	317.7	351.8	327.0	11.2	120.4	5.3	14.8	60.4	360.5	317.7	351.8	327.0
Senegal	5.5	9.0	1.5	5.2	28.9	30.6	23.0	20.9	10.4	5.5	9.0	1.5	5.2	28.9	30.6	23.9	21.5	31.7
Sierra Leone	-16.8	-12.3	-9.7	-7.2	-4.9	31.1	12.3	9.7	1.9	-16.8	-12.3	-9.7	-7.2	-4.9	31.1	12.3	9.7	1.9
Togo	-0.2	10.2	3.5	12.4	20.6	35.9	17.7	16.1	17.2	-0.2	10.2	3.5	12.4	20.6	35.9	17.7	16.1	17.2
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	2.1	13.4	5.3	15.0	23.0	40.1	21.6	20.4	24.4	2.1	13.4	5.3	15.0	23.0	40.1	21.6	20.4	24.4
Burkina Faso	9.7	17.9	6.4	14.5	48.1	57.3	43.1	36.9	26.5	9.7	17.9	6.4	14.5	48.1	57.3	43.1	36.9	26.5
Côte d'Ivoire	-2.0	7.0	1.1	9.1	16.7	31.6	14.0	12.6	11.6	-2.0	7.0	1.1	9.1	16.7	31.6	14.0	12.6	11.6
Ghana	0.5	11.8	4.1	12.0	22.6	36.0	16.3	14.4	14.1	0.5	11.8	4.1	12.0	22.6	36.0	16.3	14.4	14.1
Guinea	-3.1	3.8	-2.7	3.7	11.3	28.1	11.9	11.2	9.4	-3.1	3.8	-2.7	3.7	11.3	28.1	11.9	11.2	9.4
Guinea-Bissau	2.9	14.0	9.3	19.9	35.2	130.2	106.7	99.6	94.8	2.9	14.0	9.3	19.9	35.2	130.2	106.7	99.6	94.8
Liberia	-17.1	-12.7	-10.4	-8.2	-6.8	23.5	5.4	3.4	-3.6	-17.1	-12.7	-10.4	-8.2	-6.8	23.5	5.4	3.4	-3.6
Mali	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2
Niger	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2	18.0	22.1	7.9	17.2	73.0	78.7	68.2	54.5	34.2
Nigeria	11.2	120.4	5.3	14.8	60.4	360.5	317.7	351.8	327.0	11.2	120.4	5.3	14.8	60.4	360.5	317.7	351.8	327.0
Senegal	5.5	9.0	1.5	5.2	28.9	30.6	23.0	20.9	10.4	5.5	9.0	1.5	5.2	28.9	30.6	23.0	20.9	10.4
Sierra Leone	-16.8	-12.3	-9.7	-7.2	-4.9	31.1	12.3	9.7	1.9	-16.8	-12.3	-9.7	-7.2	-4.9	31.1	12.3	9.7	1.9
Togo	-0.2	10.2	3.5	12.4	20.6	35.9	17.7	16.1	17.2	-0.2	10.2	3.5	12.4	20.6	35.9	17.7	16.1	17.2

Table 37 Impact of climate change on sugarcane production under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-0.9	10.0	14.2	24.5	29.7	41.1	29.9	36.7	31.2	-0.9	10.0	14.2	24.5	29.7	41.1	29.9	36.7	31.2
Burkina Faso	6.1	17.1	8.5	19.6	41.5	52.2	44.8	49.4	40.4	6.1	17.1	8.5	19.6	41.5	52.2	44.8	49.4	40.4
Côte d'Ivoire	1.7	11.2	11.4	15.2	22.0	33.1	26.3	31.8	34.6	1.7	11.2	11.4	15.2	22.0	33.1	26.3	31.8	34.6
Ghana	-0.3	11.1	10.3	18.5	26.8	39.3	30.1	35.9	33.6	-0.3	11.1	10.3	18.5	26.8	39.3	30.1	35.9	33.6
Guinea	2.2	9.8	8.0	7.6	14.3	27.3	24.1	31.1	35.8	2.2	9.8	8.0	7.6	14.3	27.3	24.1	31.1	35.8
Guinea-Bissau	1.4	11.5	15.3	26.3	37.6	130.8	116.4	121.4	105.3	1.4	11.5	15.3	26.3	37.6	130.8	116.4	121.4	105.3
Liberia	-13.4	-8.9	-4.9	-9.3	-4.7	15.9	10.1	8.0	7.5	-13.4	-8.9	-4.9	-9.3	-4.7	15.9	10.1	8.0	7.5
Mali	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5
Niger	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5
Nigeria	6.0	21.9	12.9	22.3	52.2	347.6	311.0	340.9	43.8	6.0	21.9	12.9	22.3	52.2	347.6	311.0	340.9	43.8
Senegal	7.2	11.2	-3.1	3.3	16.7	20.4	12.1	15.8	6.9	7.2	11.2	-3.1	3.3	16.7	18.6	12.9	-20.3	42.8
Sierra Leone	-13.3	-8.7	-4.6	-8.5	-3.2	23.2	16.9	14.3	12.7	-13.3	-8.7	-4.6	-8.5	-3.2	23.2	16.9	14.3	12.7
Togo	1.3	11.9	13.4	20.2	26.9	38.1	29.2	34.7	33.9	1.3	11.9	13.4	20.2	26.9	38.1	29.2	34.7	33.9
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-0.9	10.0	14.2	24.5	29.7	41.1	29.9	36.7	31.2	-0.9	10.0	14.2	24.5	29.7	41.1	29.9	36.7	31.2
Burkina Faso	6.1	17.1	8.5	19.6	41.5	52.2	44.8	49.4	40.4	6.1	17.1	8.5	19.6	41.5	52.2	44.8	49.4	40.4
Côte d'Ivoire	1.7	11.2	11.4	15.2	22.0	33.1	26.3	31.8	34.6	1.7	11.2	11.4	15.2	22.0	33.1	26.3	31.8	34.6
Ghana	-0.3	11.1	10.3	18.5	26.8	39.3	30.1	35.9	33.6	-0.3	11.1	10.3	18.5	26.8	39.3	30.1	35.9	33.6
Guinea	2.2	9.8	8.0	7.6	14.3	27.3	24.1	31.1	35.8	2.2	9.8	8.0	7.6	14.3	27.3	24.1	31.1	35.8
Guinea-Bissau	1.4	11.5	15.3	26.3	37.6	130.8	116.4	121.4	105.3	1.4	11.5	15.3	26.3	37.6	130.8	116.4	121.4	105.3
Liberia	-13.4	-8.9	-4.9	-9.3	-4.7	15.9	10.1	8.0	7.5	-13.4	-8.9	-4.9	-9.3	-4.7	15.9	10.1	8.0	7.5
Mali	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5
Niger	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5	14.9	25.0	9.7	21.5	56.9	64.2	57.8	58.6	45.5

Nigeria	6.0	21.9	12.9	22.3	52.2	347.6	311.0	340.9	43.8	6.0	21.9	12.9	22.3	52.2	347.6	311.0	340.9	43.8
Senegal	7.2	11.2	-3.1	3.3	16.7	20.4	12.1	15.8	6.9	7.2	11.2	-3.1	3.3	16.7	20.4	12.1	15.8	6.9
Sierra Leone	-13.3	-8.7	-4.6	-8.5	-3.2	23.2	16.9	14.3	12.7	-13.3	-8.7	-4.6	-8.5	-3.2	23.2	16.9	14.3	12.7
Togo	1.3	11.9	13.4	20.2	26.9	38.1	29.2	34.7	33.9	1.3	11.9	13.4	20.2	26.9	38.1	29.2	34.7	33.9

Table 38 Sugarcane production without climate change (100 thousand tons)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	1.1	1.4	1.9	2.5	3.5	5.0	7.0	9.9	14.0	1.1	1.4	1.9	2.5	3.5	5.0	7.0	9.9	14.0
Burkina Faso	2.4	3.0	4.0	5.4	7.6	10.7	14.2	18.4	23.8	2.4	3.0	4.0	5.4	7.6	10.7	14.2	18.4	23.8
Côte d'Ivoire	13.2	16.7	22.1	30.2	40.3	51.3	66.2	86.2	112.6	13.2	16.7	22.1	30.2	40.3	51.3	66.2	86.2	112.6
Ghana	3.0	3.8	5.0	6.8	9.2	12.1	15.2	18.2	21.7	3.0	3.8	5.0	6.8	9.2	12.1	15.2	18.2	21.7
Guinea	3.4	4.3	5.7	7.8	10.8	15.2	21.4	30.3	42.4	3.4	4.3	5.7	7.8	10.8	15.2	21.4	30.3	42.4
Guinea-Bissau	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.6	0.8	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.6	0.8
Liberia	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.6	0.9	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.6	0.9
Mali	3.9	4.9	6.5	8.8	12.2	17.2	24.3	34.3	48.2	3.9	4.9	6.5	8.8	12.2	17.2	24.3	34.3	48.2
Niger	3.2	4.0	5.3	7.2	10.0	14.1	19.9	28.0	39.4	3.2	4.0	5.3	7.2	10.0	14.1	19.9	28.0	39.4
Nigeria	13.8	13.4	15.2	18.4	23.5	31.0	41.9	57.3	78.8	13.8	13.4	15.2	18.4	23.5	31.0	41.9	57.3	78.8
Senegal	8.3	10.5	13.8	18.8	26.2	36.8	51.8	72.3	100.6	8.3	10.5	13.8	18.8	26.2	36.8	50.1	69.9	49.5
Sierra Leone	0.5	0.6	0.8	1.1	1.5	2.0	2.9	4.1	5.7	0.5	0.6	0.8	1.1	1.5	2.0	2.9	4.1	5.7
Togo	0.5	0.7	0.9	1.2	1.7	2.4	3.4	4.8	6.8	0.5	0.7	0.9	1.2	1.7	2.4	3.4	4.8	6.8
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	1.1	1.4	1.9	2.5	3.5	5.0	7.0	9.9	14.0	1.1	1.4	1.9	2.5	3.5	5.0	7.0	9.9	14.0
Burkina Faso	2.4	3.0	4.0	5.4	7.6	10.7	14.2	18.4	23.8	2.4	3.0	4.0	5.4	7.6	10.7	14.2	18.4	23.8
Côte d'Ivoire	13.2	16.7	22.1	30.2	40.3	51.3	66.2	86.2	112.6	13.2	16.7	22.1	30.2	40.3	51.3	66.2	86.2	112.6
Ghana	3.0	3.8	5.0	6.8	9.2	12.1	15.2	18.2	21.7	3.0	3.8	5.0	6.8	9.2	12.1	15.2	18.2	21.7
Guinea	3.4	4.3	5.7	7.8	10.8	15.2	21.4	30.3	42.4	3.4	4.3	5.7	7.8	10.8	15.2	21.4	30.3	42.4
Guinea-Bissau	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.6	0.8	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.6	0.8

Liberia	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.6	0.9	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.6	0.9
Mali	3.9	4.9	6.5	8.8	12.2	17.2	24.3	34.3	48.2	3.9	4.9	6.5	8.8	12.2	17.2	24.3	34.3	48.2
Niger	3.2	4.0	5.3	7.2	10.0	14.1	19.9	28.0	39.4	3.2	4.0	5.3	7.2	10.0	14.1	19.9	28.0	39.4
Nigeria	13.8	13.4	15.2	18.4	23.5	31.0	41.9	57.3	78.8	13.8	13.4	15.2	18.4	23.5	31.0	41.9	57.3	78.8
Senegal	8.3	10.5	13.8	18.8	26.2	36.8	51.8	72.3	100.6	8.3	10.5	13.8	18.8	26.2	36.8	51.8	72.3	100.6
Sierra Leone	0.5	0.6	0.8	1.1	1.5	2.0	2.9	4.1	5.7	0.5	0.6	0.8	1.1	1.5	2.0	2.9	4.1	5.7
Togo	0.5	0.7	0.9	1.2	1.7	2.4	3.4	4.8	6.8	0.5	0.7	0.9	1.2	1.7	2.4	3.4	4.8	6.8

1.6.6. COTTON PRODUCTION

Tables 39 and 40 show that cotton production will decrease in almost all ECOWAS countries between 2050 and 2060, irrespective of the prevailing socioeconomic scenario. This decrease in cotton production is predicted to be between 1.3 and 17.4 per cent, with an average of 7.2 per cent, for SSP1, SSP3 and SSP4, and an average of 6.2 per cent for SSP2 under RCP4.5, and between 0.1 and 13.9 per cent, with an average of 6.0 per cent, for SSP1, SSP3 and SSP4, and an average of 5.3 per cent for SSP2 under RCP8.5. Cotton production decreases in Burkina Faso, Mali, the Niger, and Senegal from 2020 to 2060, irrespective of the prevailing climatic and socioeconomic scenario. That decrease in cotton production is expected to be between 1.3 and 26.1 per cent for SSP1, between 1.6 and 67.7 per cent for SSP2, between 1.3 and 29.1 per cent for SSP3, and between 1.3 and 21.0 per cent for SSP4 under RCP4.5, while the decrease is expected to be between 3.4 and 55.9 per cent for SSP1, between 4.3 and 68.7 per cent for SSP2, between 3.4 and 55.9 per cent for SSP3 and between 3.4 and 17.4 per cent for SSP4 under RCP8.5. Under certain climatic and socioeconomic scenarios, cotton production is expected to decrease in Senegal and the Niger until the end of the century. All other countries will experience an increase in cotton production either before 2040 or by the end of the century, depending on the prevailing climatic and socio-economic scenarios in those countries.

The impact of climate change on cotton production also varies across ACZs. For example, a decrease in cotton production is foreseen in both loamy and sandy soils in ACZ 17 from 2020 until the end of the century under both the moderate and harsh climate change scenarios coupled with SSP1.

Table 39 Impact of climate change on cotton production under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	1.7	8.8	0.2	-5.1	3.2	101.6	416.9	284.3	114.9	1.7	8.8	0.2	-5.1	3.2	101.6	416.9	284.3	114.9
Burkina Faso	-6.7	-1.4	-3.3	-11.8	-18.4	52.8	97.2	44.7	26.7	-6.7	-35.1	-1.6	-9.2	-10.0	303.1	556.5	311.1	272.5
Côte d'Ivoire	0.5	7.3	-2.0	-7.0	1.3	234.9	522.0	43.4	19.3	0.5	7.3	-2.0	-7.0	1.3	234.9	522.0	43.4	19.3
Gambia	0.5	7.5	-2.1	-9.1	-3.3	36.1	59.5	41.8	17.0	0.5	7.5	-2.1	-9.1	-3.3	36.1	59.5	41.8	17.0
Ghana	0.9	7.9	-0.7	-6.8	1.2	162.3	279.7	170.3	135.7	0.9	7.9	-0.7	-6.8	1.2	162.3	279.7	170.3	135.7
Guinea	6.2	12.1	-0.1	-9.1	3.2	115.0	236.8	57.9	22.8	6.2	12.1	-0.1	-9.1	3.2	115.0	236.8	57.9	22.8
Guinea-Bissau	2.1	8.4	0.2	-2.7	6.4	61.1	461.5	318.1	20.5	2.1	8.4	0.2	-2.7	6.4	61.1	461.5	318.1	20.5
Mali	-6.6	-1.3	-3.4	-12.1	-19.0	57.9	111.7	38.8	22.2	-6.6	-34.5	-1.8	-9.4	-11.3	408.5	857.3	389.2	372.9
Niger	-12.5	-8.7	-5.3	-13.9	-21.0	-8.1	6.8	0.1	-9.6	-12.5	-67.7	-5.3	-13.9	-21.0	-8.1	6.8	0.1	-9.6
Nigeria	0.2	7.0	-1.9	-9.2	-6.9	618.1	1555.8	118.3	87.9	0.2	4.6	-1.8	-8.5	-2.6	899.8	2673.1	243.7	238.3
Senegal	-26.1	-8.4	-5.8	-13.7	-19.7	-8.4	-0.4	-6.0	-8.7	-26.1	-31.7	-4.2	-10.0	-6.5	34.5	59.1	45.9	26.2
Togo	0.9	7.5	-0.9	-6.2	2.4	84.5	143.5	109.0	73.1	0.9	7.5	-0.9	-6.2	2.4	84.5	143.5	109.0	73.1
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	1.7	8.8	0.2	-5.1	3.2	101.6	416.9	284.3	114.9	1.7	8.8	0.2	-5.1	3.2	101.6	416.9	284.3	114.9
Burkina Faso	-6.7	-1.4	-3.3	-11.8	-18.4	52.8	97.2	44.7	26.7	-6.7	-1.4	-3.3	-11.8	-18.4	52.8	97.2	44.7	26.7
Côte d'Ivoire	0.5	7.3	-2.0	-7.0	1.3	234.9	522.0	43.4	19.3	0.5	7.3	-2.0	-7.0	1.3	234.9	522.0	43.4	19.3
Gambia	0.5	7.5	-2.1	-9.1	-3.3	36.1	59.5	41.8	17.0	0.5	7.5	-2.1	-9.1	-3.3	36.1	59.5	41.8	17.0
Ghana	0.9	7.9	-0.7	-6.8	1.2	162.3	279.7	170.3	135.7	0.9	7.9	-0.7	-6.8	1.2	162.3	279.7	170.3	135.7
Guinea	6.2	12.1	-0.1	-9.1	3.2	115.0	236.8	57.9	22.8	6.2	12.1	-0.1	-9.1	3.2	115.0	236.8	57.9	22.8
Guinea-Bissau	2.1	8.4	0.2	-2.7	6.4	61.1	461.5	318.1	20.5	2.1	8.4	0.2	-2.7	6.4	61.1	461.5	318.1	20.5
Mali	-6.6	-1.3	-3.4	-12.1	-19.0	57.9	111.7	38.8	22.2	-6.6	-1.3	-3.4	-12.1	-19.0	57.9	111.7	38.8	22.2
Niger	-12.5	-8.7	-5.3	-13.9	-21.0	-8.1	6.8	0.1	-9.6	-12.5	-8.7	-5.3	-13.9	-21.0	-8.1	6.8	0.1	-9.6
Nigeria	0.2	7.0	-1.9	-9.2	-6.9	618.1	1555.8	118.3	87.9	0.2	7.0	-1.9	-9.2	-6.9	618.1	1555.8	118.3	87.9
Senegal	-26.1	-29.1	-5.8	-13.7	-19.7	-8.4	-0.4	-6.0	-8.7	-11.1	-8.4	-5.8	-13.7	-19.7	-8.4	-0.4	-6.0	-8.7
Togo	0.9	7.5	-0.9	-6.2	2.4	84.5	143.5	109.0	73.1	0.9	7.5	-0.9	-6.2	2.4	84.5	143.5	109.0	73.1

Table 40 Impact of climate change on cotton production under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.9	6.5	-1.8	-5.8	32.8	102.3	415.1	357.0	116.0	0.9	6.5	-1.8	-5.8	32.8	102.3	415.1	357.0	116.0
Burkina Faso	-31.5	-3.6	-7.5	-14.5	1.7	53.0	67.2	43.0	20.7	-8.8	-36.3	-4.3	-10.9	92.1	312.1	412.5	342.3	275.2
Côte d'Ivoire	1.9	7.4	-1.9	-6.9	2.5	237.1	223.6	101.2	17.1	1.9	7.4	-1.9	-6.9	2.5	237.1	223.6	101.2	17.1
Gambia	2.0	7.3	-2.3	-9.5	-1.1	37.9	64.8	41.9	17.2	2.0	7.3	-2.3	-9.5	-1.1	37.9	64.8	41.9	17.2
Ghana	1.3	7.1	-1.5	-7.2	57.8	165.7	227.8	185.1	135.7	1.3	7.1	-1.5	-7.2	57.8	165.7	227.8	185.1	135.7
Guinea	6.7	14.5	2.9	-6.7	5.0	114.7	141.0	88.8	37.9	6.7	14.5	2.9	-6.7	5.0	114.7	141.0	88.8	37.9
Guinea-Bissau	1.1	6.5	-1.6	-2.9	6.2	58.5	450.5	467.3	16.4	1.1	6.5	-1.6	-2.9	6.2	58.5	450.5	467.3	16.4
Mali	-30.8	-3.4	-7.5	-14.9	-1.9	57.8	67.0	39.0	15.7	-8.6	-35.6	-4.3	-11.1	93.4	419.1	548.7	456.0	376.4
Niger	-55.9	-11.5	-11.2	-17.4	-26.9	-10.2	-0.8	-7.0	-16.9	-16.3	-68.7	-11.2	-17.4	-26.9	-10.2	-0.8	-7.0	-16.9
Nigeria	-0.5	6.6	-2.6	-10.2	21.4	627.5	627.3	299.4	85.8	1.2	4.2	-2.2	-9.1	36.0	914.5	1080.4	624.4	244.3
Senegal	-39.1	-8.7	-10.9	-14.8	-19.5	-6.9	-4.2	-12.6	-16.8	-27.3	-31.8	-7.2	-10.5	-1.5	34.8	60.3	44.5	23.4
Togo	1.4	7.3	-1.3	-6.3	28.0	85.2	140.0	116.1	71.8	1.4	7.3	-1.3	-6.3	28.0	85.2	140.0	116.1	71.8
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.9	6.5	-1.8	-5.8	32.8	102.3	415.1	357.0	116.0	0.9	6.5	-1.8	-5.8	32.8	102.3	415.1	357.0	116.0
Burkina Faso	-31.5	-3.6	-7.5	-14.5	1.7	53.0	67.2	43.0	20.7	-8.8	-3.6	-7.5	-14.5	1.7	53.0	67.2	43.0	20.7
Côte d'Ivoire	1.9	7.4	-1.9	-6.9	2.5	237.1	223.6	101.2	17.1	1.9	7.4	-1.9	-6.9	2.5	237.1	223.6	101.2	17.1
Gambia	2.0	7.3	-2.3	-9.5	-1.1	37.9	64.8	41.9	17.2	2.0	7.3	-2.3	-9.5	-1.1	37.9	64.8	41.9	17.2
Ghana	1.3	7.1	-1.5	-7.2	57.8	165.7	227.8	185.1	135.7	1.3	7.1	-1.5	-7.2	57.8	165.7	227.8	185.1	135.7
Guinea	6.7	14.5	2.9	-6.7	5.0	114.7	141.0	88.8	37.9	6.7	14.5	2.9	-6.7	5.0	114.7	141.0	88.8	37.9
Guinea-Bissau	1.1	6.5	-1.6	-2.9	6.2	58.5	450.5	467.3	16.4	1.1	6.5	-1.6	-2.9	6.2	58.5	450.5	467.3	16.4
Mali	-30.8	-3.4	-7.5	-14.9	-1.9	57.8	67.0	39.0	15.7	-8.6	-3.4	-7.5	-14.9	-1.9	57.8	67.0	39.0	15.7
Niger	-55.9	-11.5	-11.2	-17.4	-26.9	-10.2	-0.8	-7.0	-16.9	-16.3	-11.5	-11.2	-17.4	-26.9	-10.2	-0.8	-7.0	-16.9
Nigeria	-0.5	6.6	-2.6	-10.2	21.4	627.5	627.3	299.4	85.8	1.2	6.6	-2.6	-10.2	21.4	627.5	627.3	299.4	85.8
Senegal	-39.1	-29.6	-10.9	-14.8	-19.5	-6.9	-4.2	-12.6	-16.8	-12.5	-8.7	-10.9	-14.8	-19.5	-6.9	-4.2	-12.6	-16.8
Togo	1.4	7.3	-1.3	-6.3	28.0	85.2	140.0	116.1	71.8	1.4	7.3	-1.3	-6.3	28.0	85.2	140.0	116.1	71.8

Table 41 Cotton production without climate change (10 thousand tons)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	14.0	17.7	23.2	31.2	33.4	42.5	27.0	36.8	50.3	14.0	17.7	23.2	31.2	33.4	42.5	27.0	36.8	50.3
Burkina Faso	1.9	2.4	2.9	3.6	4.0	5.5	7.7	10.7	14.9	1.9	2.4	1.6	1.6	1.0	1.1	1.3	1.5	1.9
Côte d'Ivoire	31.1	39.4	39.0	25.9	32.2	41.7	49.3	56.8	65.8	31.1	39.4	39.0	25.9	32.2	41.7	49.3	56.8	65.8
Gambia	0.2	0.2	0.3	0.4	0.5	0.8	1.1	1.5	2.1	0.2	0.2	0.3	0.4	0.5	0.8	1.1	1.5	2.1
Ghana	3.0	3.8	4.7	5.5	4.8	6.4	7.7	9.4	11.5	3.0	3.8	4.7	5.5	4.8	6.4	7.7	9.4	11.5
Guinea	4.4	5.6	6.4	6.6	8.7	9.9	11.4	13.1	15.0	4.4	5.6	6.4	6.6	8.7	9.9	11.4	13.1	15.0
Guinea-Bissau	0.5	0.6	0.8	1.1	1.5	1.9	0.8	0.9	1.1	0.5	0.6	0.8	1.1	1.5	1.9	0.8	0.9	1.1
Mali	5.1	6.4	7.8	9.2	10.2	14.1	19.6	27.4	38.0	5.1	6.4	4.2	3.7	2.1	2.2	2.4	2.7	3.2
Niger	1.4	1.8	2.3	3.2	4.4	6.2	8.8	12.4	17.3	1.4	1.8	0.6	0.5	0.5	0.4	0.4	0.4	0.4
Nigeria	77.5	98.3	91.6	44.9	39.6	43.3	46.5	54.3	65.3	77.5	98.3	87.4	38.7	30.4	29.9	27.0	26.4	25.7
Senegal	5.0	6.4	8.4	11.5	15.8	22.2	30.7	41.7	43.9	5.0	4.3	3.3	3.7	4.3	5.4	6.3	7.4	8.6
Togo	14.1	17.9	23.2	30.9	34.2	47.0	54.4	65.5	79.1	14.1	17.9	23.2	30.9	34.2	47.0	54.4	65.5	79.1
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	14.0	17.7	23.2	31.2	33.4	42.5	27.0	36.8	50.3	14.0	17.7	23.2	31.2	33.4	42.5	27.0	36.8	50.3
Burkina Faso	1.9	2.4	2.9	3.6	4.0	5.5	7.7	10.7	14.9	1.9	2.4	2.9	3.6	4.0	5.5	7.7	10.7	14.9
Côte d'Ivoire	31.1	39.4	39.0	25.9	32.2	41.7	49.3	56.8	65.8	31.1	39.4	39.0	25.9	32.2	41.7	49.3	56.8	65.8
Gambia	0.2	0.2	0.3	0.4	0.5	0.8	1.1	1.5	2.1	0.2	0.2	0.3	0.4	0.5	0.8	1.1	1.5	2.1
Ghana	3.0	3.8	4.7	5.5	4.8	6.4	7.7	9.4	11.5	3.0	3.8	4.7	5.5	4.8	6.4	7.7	9.4	11.5
Guinea	4.4	5.6	6.4	6.6	8.7	9.9	11.4	13.1	15.0	4.4	5.6	6.4	6.6	8.7	9.9	11.4	13.1	15.0
Guinea-Bissau	0.5	0.6	0.8	1.1	1.5	1.9	0.8	0.9	1.1	0.5	0.6	0.8	1.1	1.5	1.9	0.8	0.9	1.1
Mali	5.1	6.4	7.8	9.2	10.2	14.1	19.6	27.4	38.0	5.1	6.4	7.8	9.2	10.2	14.1	19.6	27.4	38.0
Niger	1.4	1.8	2.3	3.2	4.4	6.2	8.8	12.4	17.3	1.4	1.8	2.3	3.2	4.4	6.2	8.8	12.4	17.3
Nigeria	77.5	98.3	91.6	44.9	39.6	43.3	46.5	54.3	65.3	77.5	98.3	91.6	44.9	39.6	43.3	46.5	54.3	65.3
Senegal	5.0	6.4	8.4	11.5	15.8	22.2	30.7	41.7	43.9	5.0	6.4	8.4	11.5	15.8	22.2	30.7	41.7	43.9
Togo	14.1	17.9	23.2	30.9	34.2	47.0	54.4	65.5	79.1	14.1	17.9	23.2	30.9	34.2	47.0	54.4	65.5	79.1

1.6.7. COCOA, COFFEE AND SESAME PRODUCTION

Table 42 shows that cocoa, coffee and sesame production is expected to decrease in ECOWAS countries in all years except 2050 and 2060 under the moderate climate change scenario, irrespective of the prevailing socioeconomic scenario. The decrease in production is expected to be between 1 and 21.2 per cent, with an average of 7.37 per cent. Cocoa, coffee and sesame production in ECOWAS countries, with the exception of Guinea, Liberia, Sierra Leone and Togo, is expected to increase in 2050 and 2060 by between 2 and 8.1 per cent, with an average increase of 4.5 per cent, under the moderate climate change scenario, irrespective of the prevailing socioeconomic scenario. Under the harsh climate change scenario, however, cocoa, coffee and sesame production will almost certainly decline in all ECOWAS countries from 2020 onwards, irrespective of the prevailing socioeconomic scenario. The impact of climate change on cocoa, coffee and sesame production also varies across ACZs. For example, cocoa, coffee, and sesame production is expected to increase in clay soils in ACZ 22, and sandy soils in ACZ 33 under both moderate and harsh climate change scenarios coupled with SSP1 from 2050 to 2065. Overall, the impact of climate change varies across countries and geographic units as predicted by previous studies (Mendelsohn and others, 2006; Seo and others, 2009; Medellin-Azuara and others, 2011).

Table 42 Impact of climate change on cocoa, coffee, and sesame production under RCP4.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1
Burkina Faso	-1.0	-2.3	-2.6	2.4	7.6	-1.3	-16.0	-11.6	-7.2	-1.0	-2.3	-2.6	2.4	7.6	-1.3	-16.0	-11.6	-7.2
Côte d'Ivoire	-2.1	-0.4	-1.1	2.0	3.3	-6.4	-17.7	-12.2	-6.4	-2.1	-0.4	-1.1	2.0	3.3	-6.4	-17.7	-12.2	-6.4
Gambia	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1
Ghana	-1.9	-0.3	-0.9	2.2	3.5	-6.1	-17.6	-12.0	-6.3	-1.9	-0.3	-0.9	2.2	3.5	-6.1	-17.6	-12.0	-6.3
Guinea	-5.3	-2.7	-2.7	-1.0	-1.6	-11.0	-19.6	-12.4	-6.9	-5.3	-2.7	-2.7	-1.0	-1.6	-11.0	-19.6	-12.4	-6.9
Liberia	-9.9	-5.6	-3.8	-3.9	-8.7	-14.9	-21.2	-10.3	-7.5	-9.9	-5.6	-3.8	-3.9	-8.7	-14.9	-21.2	-10.3	-7.5
Mali	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1
Nigeria	-1.6	-0.1	-0.8	2.5	4.1	-5.5	-17.3	-12.2	-6.2	-1.6	-0.1	-0.8	2.5	4.1	-5.5	-17.3	-12.2	-6.2
Senegal	-1.6	-1.8	-2.7	2.9	7.8	-1.2	-16.0	-11.6	-7.1	-1.6	-1.8	-2.7	2.9	7.8	-1.2	-16.0	-11.6	-7.1
Sierra Leone	-10.1	-5.4	-3.8	-4.2	-8.4	-14.6	-20.7	-10.4	-7.3	-10.1	-5.4	-3.8	-4.2	-8.4	-14.6	-20.7	-10.4	-7.3
Togo	-5.0	-2.7	-2.8	-0.4	-0.1	-9.7	-19.2	-12.6	-6.9	-5.0	-2.7	-2.8	-0.4	-0.1	-9.7	-19.2	-12.6	-6.9
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1
Burkina Faso	-1.0	-2.3	-2.6	2.4	7.6	-1.3	-16.0	-11.6	-7.2	-1.0	-2.3	-2.6	2.4	7.6	-1.3	-16.0	-11.6	-7.2
Côte d'Ivoire	-2.1	-0.4	-1.1	2.0	3.3	-6.4	-17.7	-12.2	-6.4	-2.1	-0.4	-1.1	2.0	3.3	-6.4	-17.7	-12.2	-6.4
Gambia	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1
Ghana	-1.9	-0.3	-0.9	2.2	3.5	-6.1	-17.6	-12.0	-6.3	-1.9	-0.3	-0.9	2.2	3.5	-6.1	-17.6	-12.0	-6.3
Guinea	-5.3	-2.7	-2.7	-1.0	-1.6	-11.0	-19.6	-12.4	-6.9	-5.3	-2.7	-2.7	-1.0	-1.6	-11.0	-19.6	-12.4	-6.9
Liberia	-9.9	-5.6	-3.8	-3.9	-8.7	-14.9	-21.2	-10.3	-7.5	-9.9	-5.6	-3.8	-3.9	-8.7	-14.9	-21.2	-10.3	-7.5
Mali	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1	-2.3	-1.3	-2.8	3.4	8.1	-1.1	-16.0	-11.6	-7.1
Nigeria	-1.6	-0.1	-0.8	2.5	4.1	-5.5	-17.3	-12.2	-6.2	-1.6	-0.1	-0.8	2.5	4.1	-5.5	-17.3	-12.2	-6.2
Senegal	-1.6	-1.8	-2.7	2.9	7.8	-1.2	-16.0	-11.6	-7.1	-1.6	-1.8	-2.7	2.9	7.8	-1.2	-16.0	-11.6	-7.1
Sierra Leone	-10.1	-5.4	-3.8	-4.2	-8.4	-14.6	-20.7	-10.4	-7.3	-10.1	-5.4	-3.8	-4.2	-8.4	-14.6	-20.7	-10.4	-7.3
Togo	-5.0	-2.7	-2.8	-0.4	-0.1	-9.7	-19.2	-12.6	-6.9	-5.0	-2.7	-2.8	-0.4	-0.1	-9.7	-19.2	-12.6	-6.9

Table 43 Impact of climate change on cocoa, coffee and sesame production under RCP8.5

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3
Burkina Faso	-1.4	2.1	0.0	6.0	7.4	-0.4	-14.4	-11.7	-8.2	-1.4	2.1	0.0	6.0	7.4	-0.4	-14.4	-11.7	-8.2
Côte d'Ivoire	-1.7	2.4	0.0	5.1	5.4	-1.3	-14.7	-11.6	-6.7	-1.7	2.4	0.0	5.1	5.4	-1.3	-14.7	-11.6	-6.7
Gambia	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3
Ghana	-1.7	2.1	-0.2	4.9	5.4	-0.9	-14.2	-10.7	-6.0	-1.7	2.1	-0.2	4.9	5.4	-0.9	-14.2	-10.7	-6.0
Guinea	-2.8	3.3	0.4	3.5	2.1	-4.9	-17.1	-14.3	-8.7	-2.8	3.3	0.4	3.5	2.1	-4.9	-17.1	-14.3	-8.7
Liberia	-5.2	1.4	-1.4	-2.3	-3.8	-6.9	-15.8	-10.6	-7.1	-5.2	1.4	-1.4	-2.3	-3.8	-6.9	-15.8	-10.6	-7.1
Mali	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3
Nigeria	-1.5	2.3	-0.1	5.3	6.0	-0.6	-14.2	-10.9	-6.1	-1.5	2.3	-0.1	5.3	6.0	-0.6	-14.2	-10.9	-6.1
Senegal	-1.2	3.6	1.1	6.7	7.7	-0.1	-14.4	-11.8	-8.2	-1.2	3.6	1.1	6.7	7.7	-0.1	-14.4	-11.8	-8.2
Sierra Leone	-4.7	2.7	-0.7	-1.4	-2.8	-6.7	-15.8	-11.0	-7.8	-4.7	2.7	-0.7	-1.4	-2.8	-6.7	-15.8	-11.0	-7.8
Togo	-2.7	3.4	0.6	4.1	2.9	-4.4	-17.1	-14.5	-8.7	-2.7	3.4	0.6	4.1	2.9	-4.4	-17.1	-14.5	-8.7
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3
Burkina Faso	-1.4	2.1	0.0	6.0	7.4	-0.4	-14.4	-11.7	-8.2	-1.4	2.1	0.0	6.0	7.4	-0.4	-14.4	-11.7	-8.2
Côte d'Ivoire	-1.7	2.4	0.0	5.1	5.4	-1.3	-14.7	-11.6	-6.7	-1.7	2.4	0.0	5.1	5.4	-1.3	-14.7	-11.6	-6.7
Gambia	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3
Ghana	-1.7	2.1	-0.2	4.9	5.4	-0.9	-14.2	-10.7	-6.0	-1.7	2.1	-0.2	4.9	5.4	-0.9	-14.2	-10.7	-6.0
Guinea	-2.8	3.3	0.4	3.5	2.1	-4.9	-17.1	-14.3	-8.7	-2.8	3.3	0.4	3.5	2.1	-4.9	-17.1	-14.3	-8.7
Liberia	-5.2	1.4	-1.4	-2.3	-3.8	-6.9	-15.8	-10.6	-7.1	-5.2	1.4	-1.4	-2.3	-3.8	-6.9	-15.8	-10.6	-7.1
Mali	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3	-1.0	5.0	2.2	7.5	7.9	0.0	-14.4	-11.8	-8.3
Nigeria	-1.5	2.3	-0.1	5.3	6.0	-0.6	-14.2	-10.9	-6.1	-1.5	2.3	-0.1	5.3	6.0	-0.6	-14.2	-10.9	-6.1
Senegal	-1.2	3.6	1.1	6.7	7.7	-0.1	-14.4	-11.8	-8.2	-1.2	3.6	1.1	6.7	7.7	-0.1	-14.4	-11.8	-8.2
Sierra Leone	-4.7	2.7	-0.7	-1.4	-2.8	-6.7	-15.8	-11.0	-7.8	-4.7	2.7	-0.7	-1.4	-2.8	-6.7	-15.8	-11.0	-7.8
Togo	-2.7	3.4	0.6	4.1	2.9	-4.4	-17.1	-14.5	-8.7	-2.7	3.4	0.6	4.1	2.9	-4.4	-17.1	-14.5	-8.7

Table 44 Cocoa, coffee, and sesame production without climate change (10 thousand tons)

	SSP1: Cash, Control and Calories									SSP2: Self-Determination								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.9	1.2	1.6	2.1	3.0	4.2	5.9	8.3	11.7	0.9	1.2	1.6	2.1	3.0	4.2	5.9	8.3	11.7
Burkina Faso	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.3	0.4
Côte d'Ivoire	69.5	88.3	104.7	118.8	137.4	161.6	191.4	227.3	266.4	69.5	88.3	104.7	118.8	137.4	161.6	191.4	227.3	266.4
Gambia	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.5
Ghana	55.4	70.3	83.0	93.5	107.2	124.6	144.1	166.1	190.5	55.4	70.3	83.0	93.5	107.2	124.6	144.1	166.1	190.5
Guinea	4.2	5.3	6.7	8.4	10.8	14.2	18.9	25.3	31.8	4.2	5.3	6.7	8.4	10.8	14.2	18.9	25.3	31.8
Liberia	0.6	0.7	1.0	1.3	1.8	2.6	3.4	4.4	4.1	0.6	0.7	1.0	1.3	1.8	2.6	3.4	4.4	4.1
Mali	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.5	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.5
Nigeria	80.6	102.3	120.3	134.5	152.9	175.9	202.9	233.7	267.7	80.6	102.3	120.3	134.5	152.9	175.9	202.9	233.7	267.7
Senegal	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.6	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.6
Sierra Leone	2.7	3.4	4.6	6.2	8.6	12.2	16.5	22.1	18.5	2.7	3.4	4.6	6.2	8.6	12.2	16.5	22.1	18.5
Togo	4.6	5.8	7.4	9.3	12.2	16.2	21.7	29.4	39.8	4.6	5.8	7.4	9.3	12.2	16.2	21.7	29.4	39.8
	SSP3: Civil Society to the Rescue?									SSP4: Save Yourself								
	2020	2030	2040	2050	2060	2070	2080	2090	2100	2020	2030	2040	2050	2060	2070	2080	2090	2100
Benin	0.9	1.2	1.6	2.1	3.0	4.2	5.9	8.3	11.7	0.9	1.2	1.6	2.1	3.0	4.2	5.9	8.3	11.7
Burkina Faso	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.3	0.4
Côte d'Ivoire	69.5	88.3	104.7	118.8	137.4	161.6	191.4	227.3	266.4	69.5	88.3	104.7	118.8	137.4	161.6	191.4	227.3	266.4
Gambia	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.5
Ghana	55.4	70.3	83.0	93.5	107.2	124.6	144.1	166.1	190.5	55.4	70.3	83.0	93.5	107.2	124.6	144.1	166.1	190.5
Guinea	4.2	5.3	6.7	8.4	10.8	14.2	18.9	25.3	31.8	4.2	5.3	6.7	8.4	10.8	14.2	18.9	25.3	31.8
Liberia	0.6	0.7	1.0	1.3	1.8	2.6	3.4	4.4	4.1	0.6	0.7	1.0	1.3	1.8	2.6	3.4	4.4	4.1
Mali	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.5	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.5
Nigeria	80.6	102.3	120.3	134.5	152.9	175.9	202.9	233.7	267.7	80.6	102.3	120.3	134.5	152.9	175.9	202.9	233.7	267.7
Senegal	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.6	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.6
Sierra Leone	2.7	3.4	4.6	6.2	8.6	12.2	16.5	22.1	18.5	2.7	3.4	4.6	6.2	8.6	12.2	16.5	22.1	18.5
Togo	4.6	5.8	7.4	9.3	12.2	16.2	21.7	29.4	39.8	4.6	5.8	7.4	9.3	12.2	16.2	21.7	29.4	39.8

4. CONCLUSION

The present working paper considers the implications of climate change in terms of land allocation and crop production across ECOWAS countries using data obtained from an ACSZ-based bioeconomic model. The data obtained from that model strongly suggest that future climatic and socioeconomic scenarios will have a significant impact on the acreage of various crops grown in the ECOWAS region, and that production may rise in certain scenarios and may fall in others. However, the production of paddy rice, maize, sorghum, millet, oil seeds, cocoa, coffee, and sesame will probably decline as a result of both moderate and harsh climate change in most cases. The study underscores the fact that crop acreage and production in ECOWAS countries are particularly sensitive to climate change. Climate change will lead to a shift in land used for agricultural production within and among countries as farmers seek to maximize profits and realize the full potential of their agricultural activities. A structural transformation will inevitably take place in the agricultural sector in order to offset the negative impact of climate change and improve the lives of the population. The impact of climate change will, moreover, vary across countries and ACZs.

Although this paper does not look at possible adaptation strategies to mitigate the impact of climate change, it is clear that international and collective action to reduce GHG emissions is urgently needed, as are effective climate change adaptation strategies to improve the livelihoods of people in West Africa. Our modeling approach does not account for water scarcity as well as supply-induced price changes due to climate change. It is possible that incorporating those factors into the study would have modified the results of the study. The impact of those factors on crop acreage and production will be investigated in future research projects.

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