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Effects of extreme weather events on agriculture and women's food security in Cameroon

Célestin SIKUBE TAKAMGNO*¹, Hélène MAISONNAVE², Nina FOTSO MAYAP³

This study evaluates the socioeconomic and gendered impacts of extreme weather events on food security in Cameroon by combining an estimation of changes in agricultural yields because of climate change in the country with quantitative modelling. The estimations are modelled using an autoregressive distributed lag, while a computable general equilibrium model in which agricultural production is differentiated by agroecological zones is used to assess the economy-wide impacts. We find that the high savannah and bimodal forest zone (HSZ-BFZ) is the zone most affected by climate shocks regardless of the scenario tested and that female workers are the most affected, irrespective of their level of skill. Food insecurity is worsened, especially among female-headed households living in rural areas. These results help us to better assess the differentiated impacts of climate change to formulate more targeted adaptation policies.

JEL Classification: Q54; Q18; J16; C68; O55

Keywords: Climate change, food security, Agricultural sector, gender, CGE model, Cameroon.

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1. Introduction

The effects of climate variability and change can be felt in virtually every country in the world (Dell et al 2012, 2014, Graff Zivin and Neidell 2014, Burke and Emerick, 2016, Colacito et al 2019, Acevedo et al 2020, Galbusera and Giannopoulos, 2018), and poor countries are affected the most (IPCC 2014, Tol 2018; Kahn, 2005; Winsemius et al. 2018; Campbell-lendrum and Corvala, 2007). Droughts, rising temperatures, floods, reduced rainfall, and the irregular duration of seasons cause land degradation and affect the growth of many crops (IPCC, 2014). This leads to a drop in agricultural production and may jeopardize food security (FAO, 1996; Hall et al., 2017; Cabral, 2011; Carleton and Hsiang, 2016; Schlenker and Roberts, 2009; Burke and Emerick, 2016).

Given the degradation of land and the disruption of seasons leading to higher temperatures and lower rainfall, the agricultural sector is among those most affected by climate variability. According to the IPCC (2014), approximately 46% of Africa's land area is subject to soil degradation, affecting an estimated 485 million people and causing losses of approximately US\$9.3 billion per year. Worse still, approximately 70-80% of the continent's cultivated land is degraded, resulting in losses of 30-60 kg of nutrients per hectare per year (IPCC, 2014).

In developing countries, agriculture is a key sector of the economy, providing an essential source of job creation and poverty reduction (FAO, 2011). Indeed, agriculture is the sector in which women are predominantly employed in African countries, where they represent nearly 50% of the workforce (Njobe and Kaaria, 2015). Despite this strong representation and important contribution to the agricultural sector, women face many difficulties that make them more vulnerable (Adzawla et al., 2019; Paudyal et al., 2019; Rao et al., 2019; Eastin, 2018). They have considerably less access than men to land, agricultural inputs (fertilizers), credit and other forms of funding, modern production techniques, education, etc. (FAO, 2011). Furthermore, due to their greater involvement in household activities, women have less time to devote to agricultural activities. This adversely affects their agricultural productivity and, consequently, the amount of revenue they can generate (Njobe and Kaaria, 2015).

Cameroon is not sheltered from climate change and its adverse effects, which vary from one agroecological zone (AEZ) to another⁴. There has been a steady decline in rainfall, a gradual increase in temperatures and an upsurge in extreme events (strong winds and violent storms, floods, landslides,

⁴ Due to its climatic diversity, Cameroon counts five (05) AEZs: the Sudano-Sahelian Zone (SSZ), the High Savannah Zone (HSZ), the Moist Savannah Zone (MSZ), the Bimodal Forest Zone (BFZ), and the Mangrove Zone (MZ)

mudslides, rockfalls, landslides, etc.) across most of the country (Amougou et al., 2013, 2014, 2015; Abossolo et al., 2015). This affects agricultural production, food security and the incomes of farming households (MINEPDED, 2015). Thus, approximately 20.4% of households in the country are food insecure (particularly in the Far North, 33.7%). Among these households, nearly 26% are headed by women (MINADER, WFP and FAO, 2020). In Cameroon, 90% of food production is produced on family farms, with women contributing to an estimated 80% of this production (WFP, 2017). Over half of the workers in the agricultural sector are women who are more engaged in subsistence farming (71.6% of workers in the informal agricultural sector are women).

Various studies have analysed the impacts of climate change on women (see Chitiga-Mabugu et al. (2023) for a review) using different modelling techniques. It has generally been documented that climate factors affect men and women differently and exacerbate preexisting gender disparities (Manata and Papazu, 2009; Terry, 2009; Paudyal and al 2019; Eastin, 2018; Alston, 2013 and 2015; Goh, 2012; UN/ISDR, 2008). However, most of these studies employ a microeconomic framework and do not account for the economy-wide impacts of climate change on the economy. While many studies address climate change impacts on the economy as a whole (Kajitani and Tatano, 2018; Mysiak et al., 2016; Pauw et al., 2011; Wu and Guo, 2021, Arndt and Thurlow, 2015; Zidouemba, 2017; Bezabih et al., 2011; Reid et al., 2008; Thurlow and al., 2008; Gerard and al., 2002), only a few include a gender lens (see, for instance, Escalante and Maisonnave, 2022; Sawadogo and Fofona, 2021).

This paper builds on previous studies and aims to make several contributions. First, we build a social accounting matrix (SAM) and a static gender-aware CGE model in which the climatic diversity of Cameroon is considered. Indeed, our model disaggregates the agricultural branches by AEZ and by the main food products grown in the country, so we can identify the effects of climate change on agricultural production in each zone. Second, the climate change scenario implemented in the CGE was estimated econometrically using ARDL regressions. Consequently, the impacts of climate change are different for each crop in each AEZ. Third, we assess the socioeconomic impact of climate disasters on women's food security. Thus, this study presents a precise image of the effects of climate change on women in Cameroon and makes it possible to recommend different public policies according to the AEZ of the country.

2. Modelling and data:

2.1 The Modelling

This paper uses a two-step approach. First, we use econometric modelling to determine the changes in agricultural yields caused by climate change. These changes are then plugged into the CGE model.

First step: Econometric modelling

First, we perform econometric modelling by using an autoregressive distributed lag (ARDL) approach to estimate changes in agricultural yields as a result of climate change. To develop this modelling, we draw on the work of Belloumi (2014) on Eastern and Southern African countries and that of Yobom (2020) on 12 countries in the Sahel region.

The model is specified by a production function that is explained by climatic factors and economic inputs. More specifically, the model is written as follows:

$$Y_i = f(CC, L_i, F_i, A_i, K_i) \quad (1)$$

where Y is the index of production of product i , CC are the indicators of climate change (temperature and precipitation) L, F, A and K are the labour, fertilizers, agricultural land and capital used for the production of product i , respectively. Agricultural land is expressed in hectares, labour is expressed as the total number of economically active people, and fertilizers are given in thousands of tonnes.

In the literature, there are various specifications of the production function in relation to climate change (Barrios et al., 2008; Belloumi, M., 2014). We chose the one developed by Belloumi (2014) because it facilitates the calculation of elasticities based on the average values of the climate variables per AEZ after estimation. Indeed, the model to be estimated is explicitly written as follows:

$$Y_t = \beta_0 \cdot L_t^{\beta_1} \cdot F_t^{\beta_2} \cdot A_t^{\beta_3} \cdot K_t^{\beta_4} \cdot e^{\varepsilon_t} \cdot e^{\beta_5 R_t + \beta_7 T_t} \quad (2)$$

Changing this equation to the logarithm, we obtain the following specification:

$$\ln Y_t = \beta_0 + \beta_1 \ln L_t + \beta_2 \ln F_t + \beta_3 \ln A_t + \beta_4 \ln K_t + \beta_5 R_t + \beta_6 T_t \quad (3)$$

T and R are the climate change variables representing average temperatures expressed in °C per year and average precipitation expressed in mm per annum, respectively.

The elasticities per AEZ are then calculated by applying the average temperature and precipitation of each zone. The estimates in Equation (3) are made for the 13 agricultural products featured in the SAM by the ARDL approach, which was proposed by Pesaran et al. (2001). These estimates are made using data from FAOSTAT, the World Development Indicators (WDI) and the Climate Change Knowledge Portal. The reasons for the choice of this method, the various tests that were carried out and the results of the estimates and their analysis are presented in Appendix 8.2. The variations in agricultural crop yields because of climate change, calculated from these results, are presented in Table 1.

The optimistic scenario corresponds to the projection of fairly small changes in climate change parameters based on available information, while the pessimistic scenario corresponds to the projection of large changes in these parameters.

Table 1: Variations in agricultural crop yields as a result of climate change (%)

Agricultural products by AEZ	Optimistic	Pessimistic
SSZ-Corn	-1.4	-6.5
HZS-BFZ-Corn	-2.5	-9.0
MSZ-Corn	-2.3	-7.6
MZ-Corn	-3.1	-11.9
SSZ-Millet and Sorghum	-5.7	-27.5
MSZ-Millet and Sorghum	-9.3	-31.1
SSZ-Rice	-7.8	-8.2
HSZ-BFZ-Rice	-10.5	-10.9
MSZ-Rice	-12.6	-13.0
MZ-Rice	-11.0	-11.4
SSZ-Other cereals	-7.7	-37.0
SSZ-Tubers	-16.6	-23.7
HSZ-BFZ-Tubers	-31.0	-34.6
MSZ-Tubers	-27.8	-29.9
MZ-Tubers	-28.7	-28.8
SSZ-Bananas	-0.1	-0.5
HSZ-BFZ-Bananas	-0.2	-0.7
MSZ-Bananas	-0.2	-0.6
MZ-Bananas	-0.2	-0.9
SSZ-Oilseeds	-11.6	-18.8
HSZ-BFZ Oilseeds	-21.8	-28.9
MSZ-Oilseeds	-19.5	-26.6
MZ-Oilseeds	-26.4	-33.5
SSZ-Cottonseed and ginning products	3.2	15.2
SSZ-Fruit	2.4	11.4
HSZ-BFZ Fruit	3.6	12.6
MSZ-Fruit	4.6	15.4
MZ-Fruit	9.3	35.8
SSZ-Vegetables and ornamental flowers	-0.9	-4.3
HSZ-BFZ-Vegetables and ornamental flowers	-1.7	-5.9

Agricultural products by AEZ	Optimistic	Pessimistic
MSZ-Vegetables and Ornamental flowers	-1.5	-5.0
MZ- Vegetables and Ornamental flowers	-2.0	-7.8
HSZ-BFZ-Cocoa bean, dried	4.8	17.1
MSZ-Cocoa bean, dried	4.3	14.4
MZ-Cocoa bean, dried	5.8	22.5
HSZ-BFZ-Sun-dried coffee and tea	-10.2	-36.1
MSZ-Sun-dried coffee and tea	-10.6	-35.4
MZ-Sun-dried coffee and tea	-10.5	-40.5
SSZ-Other agricultural products	-1.0	-4.8
HSZ-BFZ-Other agricultural products	-1.9	-6.6
MSZ-Other agricultural products	-1.7	-5.6
MZ-Other agricultural products	-2.3	-8.7

Source: Authors' estimates

The above values show that climate shocks have a negative impact on almost all the selected products except cotton, fruit and cocoa beans. The negative impact of climate shocks on the yields of corn, millet/sorghum, and oilseeds is consistent with the findings of Thornton et al. (2011), Shlenker and Lobell (2010), and Thomas and Rosegrand (2015). The negative impact on rice yields is contrary to the findings of Thomas and Rosegrand (2015). The positive impact on cotton may be explained by the fact that cotton is one of the plants that can withstand climate change due to the carbon dioxide fertilizing effect (Institute for Research and Development, 2013). This study also demonstrates that this fertilizing effect is more than sufficient to compensate for the other impacts of climate change on the crop. Overall, these results are consistent with the findings of work carried out in other sub-Saharan African countries, such as that by Belloumi (2014) and Yobom (2020).

Second step: The Computable General Equilibrium Model

Although largely inspired by the Pep 1-1 model from Decaluwé et al. (2013), our model differs from it in several respects, notably in the modelling of the labour market and the regionalization of agricultural production. To consider the highly segmented nature of the labour market in Cameroon, we model the agricultural labour market differently from the nonagricultural labour market. Indeed, while the agricultural labour market is segmented according to informality and gender, the nonagricultural labour market is segmented according to skills, informality and gender. Furthermore, to consider the regional variations in climate in Cameroon, the agricultural sector is disaggregated not only according to the main crops but also according to the different AEZs. Using this disaggregation, we assume a specific labour market for each AEZ in the agricultural sector.

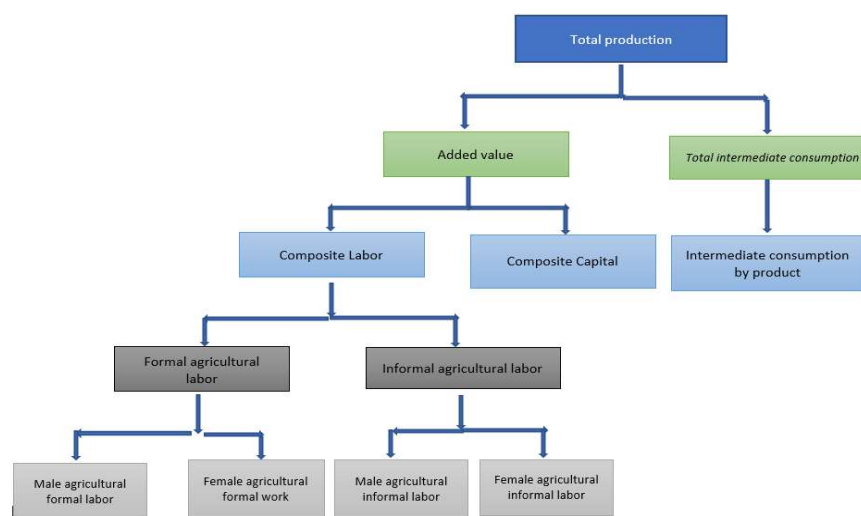
Therefore, for each branch of production in the agricultural sector, a representative firm uses a combination of different inputs to produce a good. The optimal combination is determined by profit maximization, constrained by the production technology. To capture the different degrees of input substitution, the production process is represented using nested functions.

At the first level, value added is combined with intermediate consumption according to a Leontief-type function. In other words, no substitution can be made between these two aggregates, which are always combined in the same proportions. The same applies to the various intermediate consumptions for each product. Concerning value added, there is an imperfect substitution between capital and labour, represented by a CES (constant elasticity of substitution) type function. The same assumption is made regarding the possibility of substituting different categories of workers at different levels.

Each activity uses different factors of production but in different shares. For instance, agricultural sectors are more capital intensive than other activities. This is because capital includes mixed income, especially in the informal sector. Indeed, in these activities, there are many individual workers. Labour intensive activities are found in administration or education.

An examination of the structure of labour compensation of activity reveals that in all nonagricultural sectors, the wages paid to men are higher than those paid to women. In the agricultural branches, women's wages are higher than men's only in the vegetable branch (52.0% vs. 48,0%). In Cameroon, women are more likely to work in low-paid jobs. In fact, 93.8% of employed women work in the informal sector compared with 87.5% of men (INS, EESI, 2010, 2012).

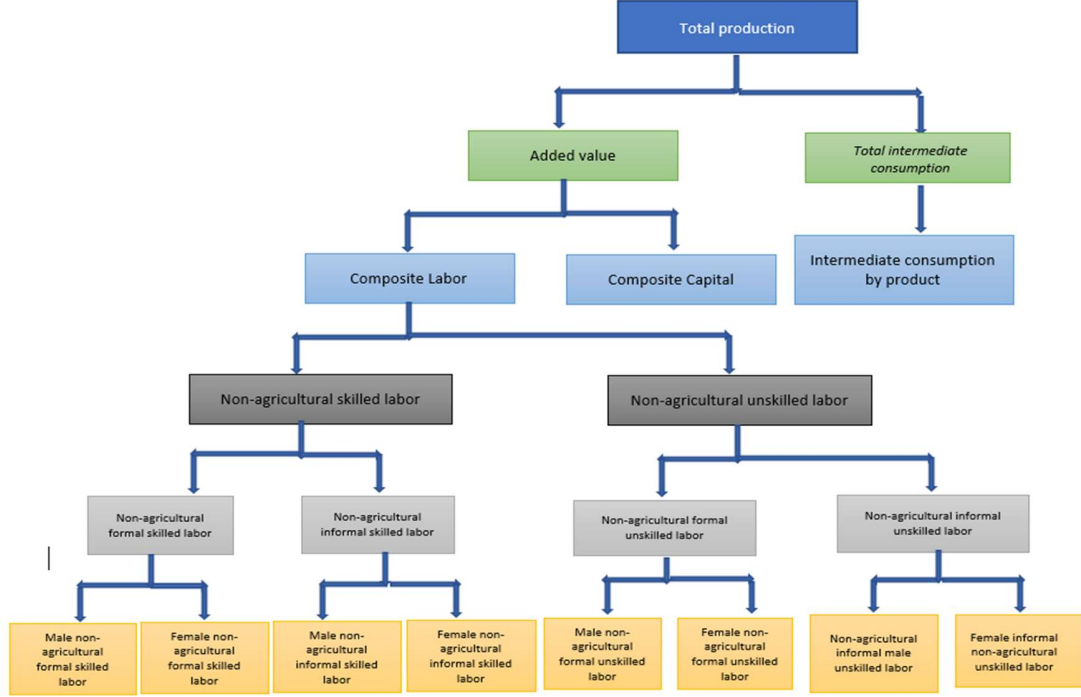
Figure 1: Structure of production in the agricultural sector



Source: The authors

Unlike in the agricultural sector, the level of skills of the workers is also considered in the non-agricultural sector.

Figure 2: Structure of production in the non-agricultural sector



Source: The authors

We consider climate change based on the study by Sawadogo et al. (2020). Indeed, they model the value added (VA_{agr}) of the agricultural sector by integrating a component that is dependent on climate change according to the following specification:

$$VA_{agr} = B_{agr}^{VA} \left[\beta_{agr}^{VA} LDC_{agr}^{-\rho_{agr}^{VA}} + (1 - \beta_{agr}^{VA}) KDC_{agr}^{-\rho_{agr}^{VA}} \right]^{-1/\rho_{agr}^{VA}} \quad (1)$$

where LDC_{agr} is the composite labour of agricultural branch agr and KDC_{agr} is the composite capital of the same agricultural branch. $B_{agr,t}^{VA}$ is the productivity parameter. This parameter is subject to climatic conditions, notably drought and rainfall.

$$B_{agr}^{VA} = B_{agr}^{VA} (1 - clim_{agr}) \quad (2)$$

where $clim_{agr}$ is the climate change parameter. For the same agricultural branch of activity, this parameter may vary from one AEZ to another. The parameters $clim_{agr}$ are estimated from econometric models inspired by Belloumi's (2014) and Yobom's (2020) works.

The household account is disaggregated into four groups according to the gender of the household head and the area of residence. In the model, it is assumed that households maximize their utility under income constraints according to a Stone–Geary function, which assumes minimum consumption for each commodity in the economy. Households receive income from labour and capital as well as from various transfers from the government and the rest of the world. From the SAM, we can see that capital income is the main source of household income for all the categories. However, it should be noted that it is precisely the mixed income from agricultural activities that constitutes a significant part of this capital income for households engaged in the agricultural sector. Despite the significant presence of women in the agricultural sector, their share of wage income derived from agricultural activities is low. The second highest source of household income in urban areas is from formal nonagricultural labour and irrespective of the household head's gender (15.13% for men and 12.26% for women). This observation is the same for male-headed households in rural areas (14.11%). In contrast, the second most important source of income for rural female-headed households is informal nonagricultural unskilled labour (8.93%).

Households pay their taxes, and the remaining disposable income is divided between consumption and savings. Regardless of the category of household and area of residence, final consumption is primarily made up of agri-food products, manufactured goods, agricultural products, and market services. Agri-food products appear more frequently in the consumption baskets of rural households, regardless of the household head's gender (26.95% and 22.47% for rural male and female households, respectively, compared to 22.11% and 19.65% for urban households). The same trend can be observed for manufactured goods, which represent 18.04% and 19.13% of the final consumption of rural male and female households, compared to 17.05% and 6.64% for urban male and female households. This trend can be explained by the fact that in urban areas, catering services are widespread, and households have become accustomed to using them. This is effectively what can be observed with regard to market services, as they are more heavily consumed by urban households, regardless of the household head's gender. In rural areas, agricultural products account for more than a fifth of the final consumption of rural women's households (23.49%), while for other households, they account for between 12% and 16%. Regardless of household category, at least 40% of their final consumption is directly or indirectly linked to agricultural production.

Firms' income comprises capital income as well as transfers from other institutional sectors. They pay taxes to the government, pay dividends to various institutions, and save the remainder. Government

income is the sum of taxes paid by the different institutional sectors and direct and indirect taxes on products and production as well as transfers from the rest of the world and a share of capital income. The government makes transfers to other institutional sectors and saves the remainder.

The income of the rest of the world is generated from sales on the Cameroonian market as well as transfers from other institutions and some capital income. These purchase commodities and make transfers to other institutional sectors. The difference between the income and expenditure of the rest of the world corresponds to the current account balance.

The relationship between the rest of the world and the domestic economy is also characterized by the supply and demand of goods. From the supply perspective, domestic production is divided between that sold locally and that exported, according to a constant elasticity of transformation (CET) function. Domestic economic agents have the choice between locally produced goods and imported goods. This decision depends on the relative prices of local and imported goods as well as the elasticities of substitution between the two goods.

To analyse the impact of climate change on food security, we consider three dimensions of food security from FAO indicators, namely, availability, accessibility, and stability. The availability indicator used is national production destined for the domestic market. Following Boccanfuso et al., 2008; Cockburn et al., 2008, Escalante and Maisonnave, 2022, accessibility is measured by the real household budget allocated to the consumption of agricultural products, as this integrates aspects of income and price and allows the gender specificity of households to be considered. We address stability using the vulnerability indicator, which is the ratio of imports to the quantities of the various agricultural products available on the domestic market. This indicator makes it possible to evaluate whether a possible decline in the domestic production of some of these agricultural products is offset by an increase in the importation of these products, thereby leading to an increase in food dependency on the external market. Hereafter, rather than referring to stability, we will refer to vulnerability.

Regarding the closure of the model, we assume that the nominal exchange rate is the numeraire. Relative prices allow for the adjustment of the supply and demand of goods. Cameroon is a small country; therefore, world prices are exogenous. Capital is sector specific, and the current account balance is exogenous.

In Cameroon, the agricultural sector is highly informal. Indeed, workers in this sector who cannot find employment in the formal sector become self-employed, work on family farms, or work as

employees on small informal farms. Therefore, it is assumed that in the agricultural labour market (in a given AEZ), the supply of formal labour may differ from the demand for both men and women. The resulting unemployment rate is determined by a wage-curve function, i.e., it is inversely related to the real wage rate: the higher the real wage rate is, the lower the unemployment rate and, conversely, the lower the real wage rate is, the higher the unemployment rate (Blanchflower and Oswald, 2005). Formal workers who have not been able to find a job in the labour market will join the supply of informal workers in the same zone. It is assumed that workers can migrate freely from one branch of activity to another but remain in the same AEZ (zone-specific labour market).

Regarding the nonagricultural labour market, it is also assumed that the supply of formal labour may differ from the demand for both skilled and unskilled workers, irrespective of their gender. The unemployment rate similarly follows a wage-curve function. Skilled and unskilled workers who have not found a job in the formal sector cannot move to another branch of activity but will be added to the supply of informal workers in the same branch of activity.

2.2 Data

This study is based on a SAM constructed using data from Cameroon's national accounts for the year 2018, which is the most recent year for which the National Institute of Statistics of Cameroon has a Supply and Use Table (SUT) and an Integrated Economic Accounts Table (IEAT). To consider the regional aspect on the one hand and the gender aspect on the other, this SAM is disaggregated using data from the second Employment and Informal Sector Survey (EESI2), the fourth Cameroonian Household Survey (ECAM4), additional data from the Ministry of Agriculture and data from the 2nd General Census of Enterprises (RGE2). Data from the fourth Cameroonian Household Survey (ECAM4) also facilitated the disaggregation of the household account.

There are 58 branches of activity in the SAM, 42 of which relate to agricultural production (13 agricultural products cross-referenced with the 4 AEZs⁵ depending on whether they are produced in a given AEZ) and 16 branches that relate to nonagricultural activities. Indeed, the climatic diversity of Cameroon is considered in the disaggregation of branches of activity. It also includes 59 products.

Agricultural production is differentiated by AEZ. The Sudano-Sahelian zone produces mainly millet and sorghum (37.3%), cotton (19.8%), vegetables (14.0%), and oilseeds, especially peanuts (9.8%) and

⁵ The High Savannah Zone and the Bimodal Forest Zone (HSZ and BFZ) were combined due to lack of data

corn (8.6%). These products represent almost 90% of the total agricultural production in this area. Rice is also extensively grown in this zone, which has a favourable climate, and 40.3% of the production of this commodity comes from this area. This zone is also home to the Society for the Expansion and Modernization of Rice-growing (SEMRY), which is the main local rice producer. In the high savannah and bimodal forest zone, the main agricultural products are vegetables and pulses (25.0%), cocoa (15.0%), tubers (10.8%), corn (13.3%) and bananas (9.6%). These products represent 84.3% of the area's agricultural production. In the moist savannah zone, agricultural production is largely dominated by vegetables and pulses (49.6%), bananas (15.2%) and corn (7.4%). In the mangrove zone, agricultural production is mainly cocoa (22.3%), vegetables and pulses (18.8%), corn (13.8%), oilseeds (9.8%) and tubers (6.5%).

Table 2: Structure of agricultural production in the AEZs (in %)

Products	SSZ	HSZ-BFZ	MSZ	MZ
Corn	8.6	13.3	7.4	13.8
Millet and sorghum	37.3	0.0	0.3	0.0
Paddy rice	2.9	1.2	2.4	0.7
Other cereals	0.6	0.0	0.01	0.0
Tubers	1.7	10.8	2.8	6.5
Bananas	0.7	9.6	15.2	3.9
Oilseeds	9.8	0.7	3.9	9.8
Cotton	19.8	0.0	0.0	0.0
Fruit	0.3	4.7	2.4	4.0
Vegetables and pulses	14.0	25.0	49.6	18.8
Cocoa	0.0	15.1	3.8	22.3
Coffee and tea	0.0	2.8	4.6	2.1
Other agricultural products	4.2	7.1	7.9	8.2
Total	100.0	100.0	100.0	100.0

Source: 2018 SAM - Cameroon

3. Results and discussion

We implement the changes in agricultural productivity estimated in the macroeconometric model for each commodity and AEZ, as presented in Table 1 above.

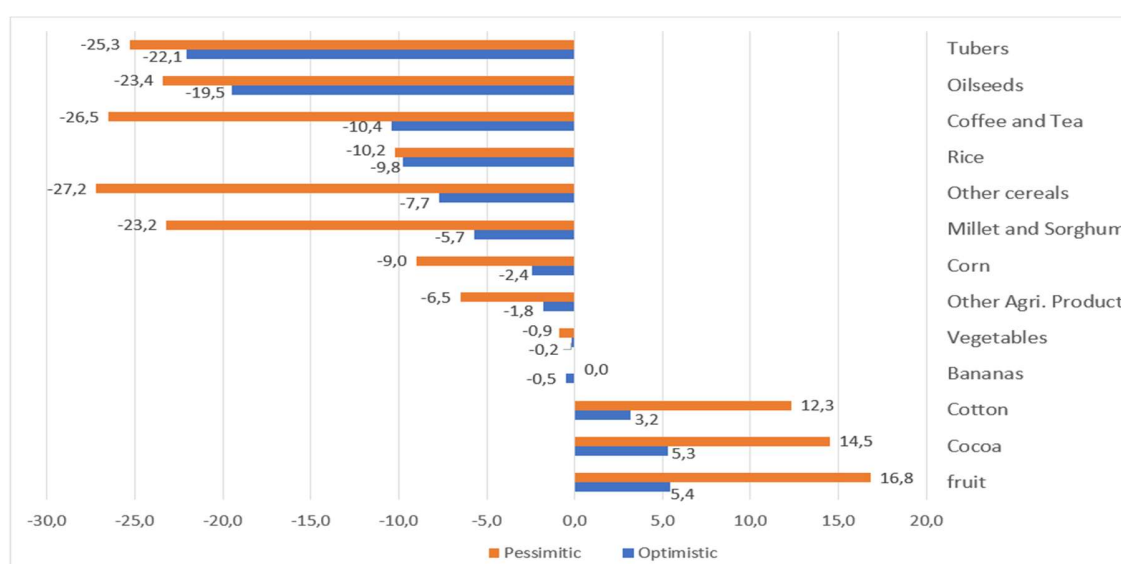
3.1 Impact on the agricultural sectors:

The results of the simulations show that the decline in agricultural productivity caused by climate shocks affects all agricultural branches. This result is quite consistent with those reported in the literature (Sawadogo et al. (2021); Bosello et al., 2017). The magnitude of the impact of climate change varies from one agricultural branch to another and from one scenario to another, depending on the sensitivity

of each branch to climate change. Therefore, regarding the optimistic scenario, the most impacted agricultural products are tubers (-22.1%), oilseeds (-19.5%), coffee and tea (-10.4%), rice (-10.2%), cocoa (-10.4%) and corn (-8.9%).

The negative shock on bananas gives mixed results, as there is a slight increase (0.1%) in the value added of this product. Other increases are observed for cotton (3.2%), cocoa (5.3%) and fruit (5.4%). These increases are in line with the shock. Regarding the pessimistic scenario, the trend of the impact is the same for all crops except for bananas, the value of which becomes negative (-0.5%). The effect differential between the optimistic and pessimistic scenarios is relatively small for rice, tubers and oilseeds (at most 20%⁶) but very high for the other products.

Figure 3 : Impact of climate change on agricultural value added (%)

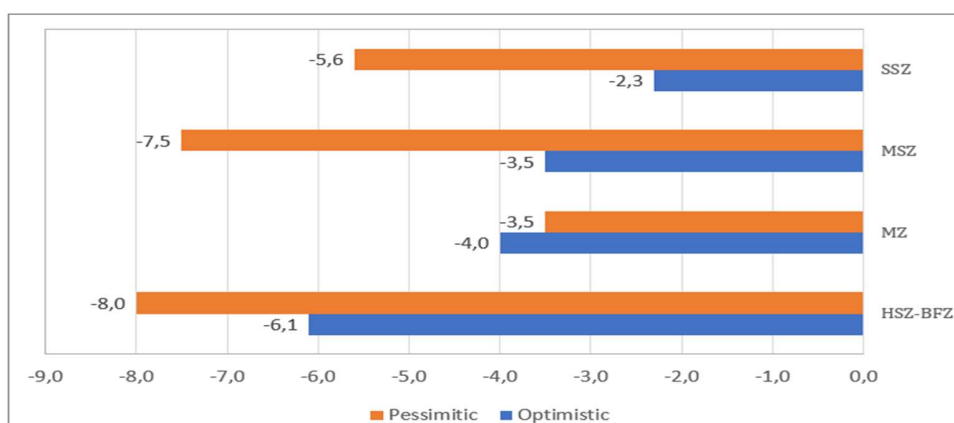


Source: The authors' simulations

An analysis by AEZ shows that in the agricultural sector, the high savannah and bimodal forest zone (HSZ-BFZ) is the zone most affected by climate shocks regardless of the scenario tested (-6.1% optimistic and -8.0% pessimistic). The second most affected zone under the optimistic scenario is the mangrove zone (MZ), with -4.0% recorded, and the moist savannah zone (MSZ) under the pessimistic scenario (-7.5%). The least affected zone under the optimistic scenario is the Sudano-Sahelian zone, where -2.5 was recorded, while under the pessimistic scenario, the mangrove zone is the least affected (-3.5%).

Figure 4: Impact of climate change on agricultural value added by AEZ (%)

⁶ The method of calculation is (pessimistic scenario variation/optimistic scenario variation)-1.



Source: The authors' simulations

The decline in value added in the various agricultural branches leads to an equivalent decline in production, notably for consumption-intensive products such as tubers, oilseeds, rice and corn. This decline in production leads to a decline in the demand for labour in both the formal and informal sectors. A closer examination of the optimistic scenario shows that in the formal sector, this decline is much more pronounced for women in the SSZ and MSZ (-0.4% versus -0.1% for men and -0.4% versus -0.2% for men). In contrast, in the HSZ and BFZ, the decline in labour demand affects men more than women (-3.9% versus -3.3%). In the mangrove zone, the demand for labour increases in the formal sector, although more significantly for men (0.8% compared to 0.2% for women).

In the informal sector, the decline is more pronounced for men in the MZ (-3.8% versus -0.3% for women). Formal workers who have lost their jobs in the SSZ, HSZ-BFZ and MSZ move to the informal sector. Consequently, there is an increase in informal work in these zones. Under the pessimistic scenario, the same trend is observed but with greater variations. Moreover, in all zones with the exception of the mangrove zone (MZ), the differences in variation between the two scenarios do not exceed 0.3%.

Table 3: Impact of climate change on the demand for agricultural labour by AEZ (%)

Zone	Optimistic				Pessimistic			
	FFAL	FMAL	IFAL	IMAL	FFAL	FMAL	IFAL	IMAL
HSZ-BFZ	-3.3	-3.9	3.7	2.5	-3.4	-4.0	3.8	2.6
MZ	0.2	0.8	-0.3	-3.8	0.6	1.1	-0.8	-5.6
MSZ	-0.4	-0.2	0.1	0.0	-0.7	-0.3	0.1	0.1
SSZ	-0.4	-0.1	0.5	1.2	-0.5	-0.1	0.6	1.2

Source: The authors' simulations

FFAL=Formal Female Agricultural Labour ; FMAL=Formal Male Agricultural Labour ; IFAL=Informal Female Agricultural Labour
IMAL=Informal Male Agricultural Labour

The effects of climate change are transmitted to the nonagricultural branches mainly through the intermediate consumption channel. The impact trend is the same regardless of the scenario, with higher amplitudes observed for the pessimistic scenario. Value added improves significantly in public administration (1.1% and 2.0%), livestock and hunting (1.7% and 2.9%) and forestry (1.6% and 2.1%).

However, it declines significantly in the health and social work branch (-5.6% and -8.6%), the food industry (-7.4% and -3.6%), trade (-1.5% and -2.5%) and education (-1.2% and -2.6%). There is also a decline in the value added of the construction sector, which is partly explained by the fact that when household incomes fall, there is less investment in construction. Consequently, there will either be an increase or a decrease in the demand for labour in response to an increase or decrease in value added in the nonagricultural branches.

3.2 Gendered impacts:

Climate change has a negative effect on workers in formal nonagricultural branches under both scenarios. Reduced production means that formal firms need to hire less skilled and unskilled workers. Nevertheless, female workers are the most affected, irrespective of their level of skills and the climate change scenario (for the optimistic scenario, -0.4% for skilled female formal workers versus -0.2% for skilled male formal workers and -0.4% for unskilled female workers versus -0.3% for unskilled male workers). Formal workers who cannot find work move to the informal sphere. As a result, there is an increase in informal work regardless of the level of skills.

At the macroeconomic level, the simulation results reveal a 0.8% decline in real GDP.

The decline in household disposable income is largely due to the negative impact of climate shocks on household wages. In fact, wages decline for all household categories irrespective of the scenario. However, the decline is more pronounced among female-headed households regardless of the area of residence (-0.9% optimistic and -1.5% pessimistic in rural areas and -0.7% optimistic and -1.3% pessimistic in urban areas).

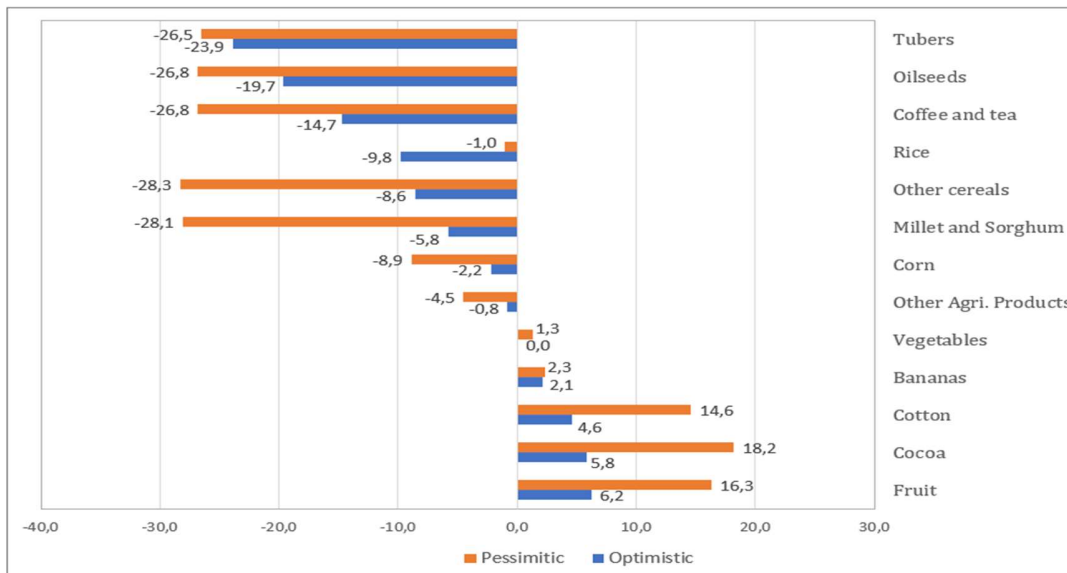
3.3 Analysis of the impact on food security

- *Impact on availability*

For the 'availability' pillar of food security, the impact of climate change is measured here by the variation in the production sold on the domestic market of the different agricultural products and the variation in imports. Production destined for the domestic economy declines for those agricultural

products that are negatively affected by climate change, and the magnitude of the decline is more pronounced for the pessimistic scenario. Based on the assumption that the optimistic scenario occurs, the products whose availability will be most affected are tubers (-23.9%), oilseeds (-19.7%), coffee and tea (-14.7%) and rice (-9.8%). On the other hand, based on the assumption that the pessimistic scenario occurs, the products that will suffer the greatest decline in available quantities are other cereals (-28.3%) and millet and sorghum (-28.1%). The products on which climate change has a positive effect and that are more available as a result of the climate shock, regardless of the scenario that occurs, are bananas, cotton, fruits and cocoa.

Figure 5: Impact of climate change on the availability of agricultural products on the domestic market (%)



Source: The authors' simulations

- **Impact on accessibility**

The effect of climate change on the 'accessibility' pillar of food security is measured here by the change in the real consumption budget of households. The simulations reveal that climate shocks have a negative impact on the real consumption budget of all categories of households regardless of the scenario, with larger impacts occurring under the pessimistic scenario.

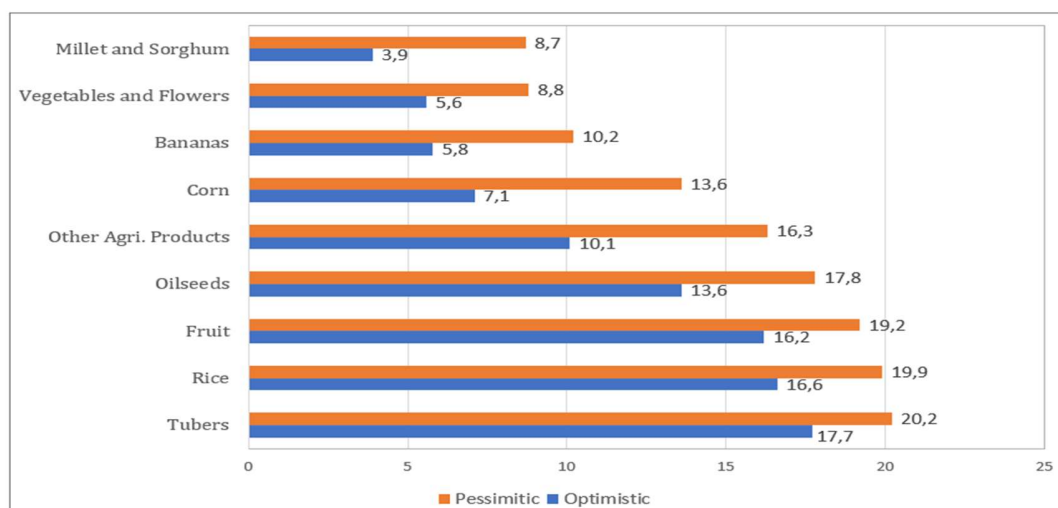
The impact is more pronounced for rural households, especially those headed by women (-1.9% compared to -1.6% for men under the optimistic scenario). The impact trend of climate change on urban household budgets is the same between those headed by women and those headed by men under both scenarios, but the pessimistic scenario affects both households to a greater extent (-1.5% for the

optimistic scenario and -2.5% for the pessimistic scenario). The decline in the real consumption budget can be explained by the decline in disposable incomes for all household categories and by the increase in the price index, particularly for agricultural products (it increases by 3.2% for the optimistic scenario and by 6.2% for the pessimistic one).

- Impact on vulnerability

The results of the simulations also show an increase in the imports of all agricultural products that is greater than the decrease in the quantities demanded. This increase is also more significant for consumer products that have seen a decline in the quantities demanded (rice, oilseeds, corn, tubers, fruits, millet and sorghum, etc.). The trend is the same regardless of the scenario envisaged.

Figure 6: Impact of climate change on the import of agricultural products (%)



Source: The authors' simulations

Thus, imports seem to offset the decline in the domestic production of agricultural products. Indeed, when we look at the ratio of imports to domestic demand, we notice that it increases for all products for which there is an increase in imports following climate shocks (Table 4). Therefore, with regard to the consumption of agricultural products, climate change tends to make the country more dependent on foreign imports, which makes it more vulnerable.

Table 4: Impact of climate change on the country's food vulnerability (%)

Products	Imports/Quantities demanded (%)		
	Base	Optimistic	Pessimistic
Bananas	43.5	46.6	47.9

Vegetables	33.0	35.1	36.5
Millet and Sorghum	30.5	32.0	35.6
Oilseeds	29.4	34.0	37.0
Tubers	27.0	32.5	34.2
Corn	24.5	26.6	28.5
Fruit	17.2	20.0	20.2
Rice	6.7	7.9	8.6
Other agricultural products	2.9	3.2	3.7

Source: The authors' simulations

4. Conclusions and policy implications

The aim of this study was to assess the gender-differentiated impact of climate change on food security in Cameroon. The issue of climate change is now a major concern of the international community, not to mention of the Cameroonian government, which considers this in all its strategic plans. This sector, whose production largely ensures the food security of the country, is also the sector that is most exposed to climate change. It employs nearly 80% of the working population, more than 60% of whom are women.

The results of the study show that the decline in yields of the various agricultural branches as a result of climate change reduces the value added of agriculture and of the other nonagricultural branches that depend on agricultural products. The magnitude of the impact of climate change on the value added of the agricultural branches differs from one AEZ to another and worsens food insecurity in terms of availability, accessibility and vulnerability as defined by the FAO. Indeed, agricultural production declines, as does the household budget allocated to the consumption of agricultural products. This decline is more pronounced for female-headed households, especially those living in rural areas. The paper also highlights that to compensate for the decline in agricultural production, the Cameroonian economy resorts to importing the impacted high-consumption products, which increases the country's dependence on the outside world and makes it more vulnerable in terms of food security.

In terms of policy implications, based on our results, we recommend that the government target policies to help women living in rural areas, especially those living in the high savannah and bimodal forest zone, which is the most affected region. An adaptation policy based on the use of fertilizer to increase agricultural productivity could be an interesting option for the government of Cameroon.

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Annexe : Estimation of econometric models

Estimates are made for the 13 agricultural products highlighted in our SAM, namely corn, millet and sorghum, tubers, oilseeds, other cereals, rice, coffee and tea, cocoa, vegetables, cotton, fruit, bananas and other agricultural products.

Owing to the availability of data, the estimates cover the period 1961-2018.

The data on climate change indicators is taken from the Climate change knowledge portal. This data source also provided us with the variables for each region, which allowed us to calculate them for each AEZ. The production index data for each product is provided by FAOStat, and the input data is provided by the World Development Indicators. The above-mentioned sources allowed us to obtain data per product only for the production index variable. All other variables were aggregated at the agricultural level. We therefore made some assumptions in order to disaggregate certain variables according to the products of interest in our study. Regarding labour, we have applied the labour structure by agricultural branch of the SAM to the data set. With regard to land and fertilisers, we applied the capital structure by agricultural branches of the SAM to the data set. Rainfall, temperature and capital were left unchanged.

8.2.1 The econometric methodology

The model specified by equation (5) is estimated by the Autoregressive Distributed Lag (ARDL) method, proposed by Pesaran et al. (2001). Compared to other conventional co-integration methods (Engle and Granger, 1987 and Johansen, 1991), the ARDL method has two main advantages. Firstly, it can be applied to any degree of integration of the variables used: purely I(0), purely I(1) or mixed. Secondly, it offers the possibility of dealing simultaneously with long-term dynamics and short-term adjustments. We therefore adopt this method to analyse the dynamic relationship between climate change (and other inputs) and agricultural production of each good.

The implementation of the ARDL method requires that unit root tests be performed for the variables beforehand. Therefore, to study the stationarity of the variables in their degree of integration, we perform the augmented Dickey-Fuller test (ADF). Subsequently, the number of lags of the dependent and explanatory variables is selected using the Akaike information criterion (AIC). Therefore, the model is analysed using the ARDL procedure, because of the need to take stock of the long-term and short-term consequences of our analysis. ARDL modelling with the appropriate lags will allow the correction of correlation and endogeneity problems of the series.

8.2.2 Analysis of the econometric modelling results

The results of the descriptive statistics for all the variables are presented in Table A9. We find that during the period 1961 and 2018, the average temperature in Cameroon varied between 24.06°C and 25.27°C and the average rainfall varied between 1323.78 and 1859.01mm. Furthermore, analysis of these statistics also shows that, on average over the period considered, the products with the highest agricultural productivity indices are coffee and tea, millet and sorghum, and cocoa, with values estimated to be 4.84, 4.05 and 3.92 respectively.

The graph A24 presents the comparative evolution of the climatic variables and the production index of each product over the period 1961-2018. Three main findings emerged. Firstly, on average and with the exception of tea and coffee, production of all the products examined has increased over the last six decades. Secondly, during this period, the flow of precipitation has followed a relatively constant trend, while the temperature has shown an increasing trend. Thirdly, the increase in temperature has usually been accompanied with an increase in the productivity of these products, although this has not always been the case for rainfall.

With regard to the econometric results more specifically, the application of ADF unit root tests on the series studied, leads to the rejection of the stationarity hypothesis for all the series, except for the production index series for corn, millet and sorghum, coffee and tea, tubers, cotton and vegetables; labour for all these products; land for oilseeds and vegetables; and fertilisers for cocoa, oilseeds, corn and other cereals, which are stationary in level. The results also show that the other series are integrated of order I(1). No series is therefore integrated of order two I(2) or higher, which is crucial for the application of the ARDL method.

For the choice of the number of lags, the AIC information criterion for each model estimated was applied. These tables also present the short-term and medium-term dynamics of the climatic variables as well as the other inputs, on the productivity of each product. To estimate the model in equation (5), we introduce in turn temperature (temp) and precipitation (pluv).

Concentrating exclusively on the short-term results (second section of the results tables), we find: (i) a negative impact of rainfall on the production of cotton; (ii) a negative impact of temperature on the production of corn; (iii) a positive impact of rainfall on the production of cocoa; (iv) a positive impact of temperature on the production of rice; (v) a negative impact of temperature and a positive impact of rainfall on tuber production; (vi) a negative impact of temperature on the production of cereals; (vii) a positive impact of rainfall on the production of fruit; and (viii) a negative impact of rainfall on the yields of other products. With regard to the other crops (vegetables, coffee, bananas, millet, oilseeds), we find no significant impacts.

The coefficients of the model are used to calculate the productivity elasticities of each product in relation to the climatic variables. The variation in the yields of each product as a result of climate shocks is thus obtained as the product of the elasticities calculated for each type of climate shock. The climate change coefficients are obtained for the optimistic and pessimistic climate change scenarios. Indeed, Cameroon's Climate-Resilient Investment Plan (2020) projects minimum (optimistic) and maximum (pessimistic) temperature and rainfall variations differing by AEZ by 2040-2060. As regards temperatures, the AEZ with the lowest variation is the moist savannah zone (1.2%) and the one with the highest increase is the Sudano-Sahelian zone (3%). With regard to rainfall, under the optimistic scenario, rainfall is expected to decline by 10% on average, while under the pessimistic scenario it is expected to decline by 20% on average across the country.

Table A7: Variation in temperature by AEZ and precipitation

Temperature	Optimistic (in °C)	Pessimistic (in °C)
SSZ	1.25	3.00
HSZ-BFZ	1.55	2.75
MSZ	1.20	2.00
MZ	1.30	2.50
Precipitation	Optimistic (in %)	Pessimistic (in %)
National	-10	-20

Source: Cameroon's climate-resilient investment plan

These variations allow us to calculate the climate change coefficients for the optimistic and pessimistic scenarios. As the temperatures are given as absolute variations, the associated percentage is obtained by adding the above change values to the average temperature values calculated over the period 1961-2018 for the AEZ. The following table shows the relative temperature changes.

Table A8: Percentage change in temperature by AEZ

Temperature	Optimistic (in °C)	Pessimistic (in °C)
SSZ	4.8	11.4
HSZ-BFZ	6.4	11.3
MSZ	5.3	8.8
MZ	5.1	9.9

Source: Authors' calculations

Table A9: Results of the stationarity test and descriptive statistics

Variables	Order of stationarity	Descriptive statistics			Min	Max
		N	Mean	Standard deviation		
Temp	I(0)	58	24.692	0.285	24.060	25.270
Pluvio	I(0)	58	1599.252	91.289	1323.780	1859.010
Temp2	I(0)	58	609.770	14.056	578.884	638.573
Pluvio2	I(0)	58	2565798.000	292055.100	1752394.000	3455918.000
Temp Pluvio	I(1)	58	39485.370	2246.405	32684.130	46326.530
Ind_prod Mais	I(0)	58	3.441	0.614	2.708	4.687
Ind_prod Mil Sorgho	I(0)	58	4.057	0.327	2.890	4.642
Ind_prod Rizpaddy	I(1)	58	2.893	0.975	0.307	4.915
Ind_prod Oleagineux	I(1)	58	3.540	0.556	2.595	4.703
Ind_prod Cacao	I(1)	58	3.926	0.372	3.347	4.765
Ind_prod Cafe The	I(0)	58	4.844	0.277	4.128	5.345
Ind_prod Bananes	I(1)	58	3.674	0.650	2.514	4.714
Ind_prod autres Cereales	I(1)	58	3.524	0.555	2.879	4.678
Ind_prod Tubercules	I(0)	58	3.612	0.535	2.933	4.659
Ind_prod Fruits	I(1)	58	3.576	0.587	2.755	4.675
Ind_prod Coton graine	I(0)	58	3.654	0.703	2.151	4.705
Ind_prod total	I(1)	58	3.652	0.529	2.770	4.642
Ind_prod légumes	I(0)	58	3.527	0.633	2.500	4.700
Log_lab Mais	I(0)	58	9.726	1.338	6.365	10.738
Log_lab Mil sorgho	I(0)	58	9.046	1.338	5.685	10.058
Log_lab riz	I(0)	58	8.698	1.338	5.337	9.710
Log_lab autres cereales	I(0)	58	12.284	1.338	8.924	13.297
Log_lab tubercules	I(0)	58	11.485	1.338	8.125	12.498
Log_lab banane	I(0)	58	12.891	1.338	9.531	13.904
Log_lab oleagineux	I(0)	58	13.188	1.338	9.828	14.201
Log_lab coton	I(0)	58	5.268	1.338	1.908	6.281
Log_lab fruits	I(0)	58	11.457	1.338	8.096	12.469
Log_lab legumes	I(0)	58	12.141	1.338	8.780	13.153
Log_lab cacao	I(0)	58	12.591	1.338	9.230	13.603
Log_lab cafe the	I(0)	58	9.106	1.338	5.746	10.119
Log_lab autres	I(0)	58	9.984	1.338	6.624	10.997
Log Terre Mais	I(1)	58	9.397	0.078	9.235	9.496
Log Terre Mil sorgho	I(1)	58	9.851	0.078	9.689	9.950
Log Terre riz	I(1)	58	7.597	0.078	7.436	7.697
Log Terre autres cereales	I(1)	58	7.962	0.078	7.800	8.061
Log Terre tubercules	I(1)	58	9.000	0.078	8.838	9.099
Log Terre banane	I(1)	58	8.477	0.078	8.316	8.577
Log Terre oleagineux	I(0)	58	7.687	0.078	7.525	7.786
Log Terre Coton	I(1)	58	7.968	0.078	7.807	8.068
Log Terre fruits	I(1)	58	4.520	0.078	4.358	4.619
Log Terre legumes	I(0)	58	9.783	0.078	9.621	9.882
Log Terre cacao	I(1)	58	9.163	0.078	9.002	9.263
Log Terre cafe the	I(1)	58	8.013	0.078	7.851	8.112
Log Terre autres	I(1)	58	8.862	0.078	8.700	8.961
Log Fertilisants Mais	I(0)	58	10.965	0.826	8.802	12.108
Log Fertilisants Mil sorgho	I(1)	58	11.419	0.826	9.256	12.562
Log Fertilisants riz	I(1)	58	9.165	0.826	7.003	10.309
Log Fertilisants autres cereale	I(0)	58	9.530	0.826	7.367	10.674
Log Fertilisants tubercules	I(1)	58	10.568	0.826	8.406	11.712
Log Fertilisants banane	I(1)	58	10.045	0.826	7.883	11.189
Log Fertilisants oleagineux	I(0)	58	9.255	0.826	7.092	10.398
Log Fertilisants Coton	I(1)	58	9.536	0.826	7.374	10.680
Log Fertilisants fruits	I(1)	58	6.088	0.826	3.925	7.232
Log Fertilisants legumes	I(1)	58	11.351	0.826	9.189	12.495
Log Fertilisants cacao	I(0)	58	10.731	0.826	8.569	11.875
Log Fertilisants cafe the	I(1)	58	9.581	0.826	7.418	10.724
Log Fertilisants autres	I(1)	58	10.430	0.826	8.267	11.574
Livestock production index	I(1)	58	4.006	0.512	3.094	4.736
log capital	I(1)	58	7.037	0.988	5.324	8.548

Source: The authors.

Note: Descriptive statistics are calculated after logarithmic transformation of the variables.

Table A10: Effect of climate change on cotton production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Coton_graine	-0.434*** (0.138)	-0.462*** (0.150)	-0.483*** (0.151)	-0.393** (0.154)	-0.454** (0.171)	-0.475*** (0.161)	-0.395** (0.180)	-0.226 (0.184)
LR								
Log_lab_coton	-0.278 (0.251)	-0.207 (0.238)	-0.271* (0.147)	-0.575** (0.279)	-0.352 (0.264)	-0.343 (0.247)	-0.408 (0.343)	-0.425 (0.563)
Log_Terre_Coton	4.978 (4.076)	3.322 (4.145)	7.929* (4.578)	7.163 (5.243)	8.358 (5.590)	7.557 (4.843)	2.705 (6.622)	11.934 (14.618)
Log_Fertilisants_Coton	0.270 (0.339)	0.279 (0.320)	0.244 (0.233)	0.707* (0.392)	0.323 (0.343)	0.343 (0.320)	0.593 (0.457)	0.052 (0.812)
log_Capital	0.466 (0.358)	0.542 (0.356)	0.303 (0.197)	0.094 (0.270)	0.383 (0.349)	0.413 (0.322)	-0.024 (0.496)	-0.672 (1.212)
temp	-0.181 (0.917)	76.392 (66.452)			2.050 (6.546)	-0.368 (0.879)	84.511 (79.344)	132.091 (144.363)
temp2		-1.553 (1.351)					-1.697 (1.606)	-1.935 (2.647)
pluvio			0.002 (0.003)	0.131 (0.086)	0.040 (0.100)	0.002 (0.003)	0.169 (0.113)	0.756 (0.752)
pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					-0.001 (0.004)			-0.022 (0.024)
SR								
D.Log_lab_coton	-0.147 (0.255)	-0.166 (0.257)	-0.265 (0.251)	-0.337 (0.240)	-0.263 (0.271)	-0.261 (0.268)	-0.396 (0.266)	-0.361 (0.247)
LD.Log_lab_coton	0.473* (0.258)	0.431 (0.261)	0.576** (0.242)	0.680*** (0.234)	0.601** (0.265)	0.592** (0.260)	0.608** (0.269)	0.645** (0.250)
D.Log_Terre_Coton	-6.805 (4.465)	-6.594 (5.043)	-4.485 (4.364)	-4.247 (4.075)	-4.807 (4.677)	-4.675 (4.602)	-4.376 (4.977)	-6.875 (4.757)
LD.Log_Terre_Coton	-2.963 (4.570)	-0.328 (4.917)	-5.102 (4.436)	-5.484 (4.296)	-4.453 (4.973)	-5.078 (4.646)	-2.178 (5.050)	3.736 (5.417)
L2D.Log_Terre_Coton	-2.830 (4.529)	-2.674 (4.926)	-4.849 (4.462)	-5.555 (4.228)	-5.515 (4.865)	-5.376 (4.787)	-4.175 (5.033)	-3.866 (4.671)
D.Log_Fertilisants_Coton	0.271* (0.158)	0.349** (0.166)	0.296* (0.152)	0.179 (0.154)	0.278 (0.189)	0.279 (0.186)	0.297 (0.191)	0.288 (0.178)
D.log_Capital	-0.242 (0.643)	-0.394 (0.652)	-0.199 (0.612)	-0.160 (0.571)	-0.276 (0.720)	-0.380 (0.659)	-0.442 (0.646)	0.446 (0.725)
D.temp	0.179 (0.304)	-20.097 (27.178)			0.209 (0.322)	0.211 (0.318)	-16.428 (25.573)	-3.079 (24.503)
LD.temp	0.134 (0.226)	-31.633 (23.731)			0.151 (0.234)	0.160 (0.229)	-19.847 (22.860)	-14.671 (21.339)
L2D.temp	0.053 (0.159)	-4.409 (19.016)			-0.009 (0.172)	-0.007 (0.169)	-4.459 (18.441)	1.072 (17.294)
D.temp2		0.411 (0.552)					0.331 (0.519)	0.060 (0.497)
LD.temp2		0.644 (0.482)					0.403 (0.464)	0.297 (0.433)
L2D.temp2		0.090 (0.386)					0.088 (0.374)	-0.023 (0.351)
D.pluvio			-0.001 (0.001)	-0.051** (0.020)	-0.001 (0.001)	-0.001 (0.001)	-0.061** (0.024)	-0.052** (0.022)
LD.pluvio			0.000 (0.001)	-0.040** (0.016)	-0.000 (0.001)	-0.000 (0.001)	-0.046** (0.019)	-0.039** (0.018)
L2D.pluvio			-0.000 (0.001)	-0.020* (0.012)	-0.000 (0.001)	-0.000 (0.001)	-0.029* (0.015)	-0.022 (0.014)
L3D.pluvio			0.000 (0.000)	-0.013* (0.007)	0.000 (0.000)	0.000 (0.000)	-0.020** (0.009)	-0.024** (0.009)
D.pluvio2				0.000** (0.000)			0.000** (0.000)	0.000** (0.000)
LD.pluvio2				0.000** (0.000)			0.000** (0.000)	0.000** (0.000)
L2D.pluvio2				0.000* (0.000)			0.000* (0.000)	0.000 (0.000)
L3D.pluvio2				0.000* (0.000)			0.000** (0.000)	0.000** (0.000)
Constant	-15.557 (18.168)	-446.704 (393.426)	-31.797 (20.073)	-63.365** (24.563)	-55.306 (77.186)	-26.440 (22.457)	-475.623 (392.582)	-528.688 (364.988)
Observations	55	55	54	54	54	54	54	54
R-squared	0.417	0.477	0.509	0.638	0.536	0.534	0.699	0.752

Table A11: Effect of climate change on corn production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Mais	-0.231** (0.087)	-0.207* (0.121)	-0.242*** (0.087)	-0.228** (0.092)	-0.222** (0.093)	-0.229** (0.093)	-0.141 (0.152)	-0.101 (0.153)
LR								
Log_lab_Mais	0.030 (0.264)	0.061 (0.323)	0.038 (0.183)	-0.118 (0.251)	0.098 (0.332)	0.091 (0.322)	0.220 (0.766)	0.196 (1.028)
Log_Terre_Mais	-9.637** (4.449)	-10.637 (6.477)	-10.374* (5.800)	-11.594* (6.467)	-13.331* (7.540)	-10.787 (6.555)	-17.863 (22.550)	-33.145 (54.022)
Log_Fertilisants_Mais	-0.050 (0.375)	-0.063 (0.426)	0.010 (0.286)	0.358 (0.418)	-0.030 (0.442)	-0.105 (0.432)	-0.054 (0.810)	0.560 (1.300)
log_Capital	1.343*** (0.394)	1.475** (0.566)	1.308*** (0.262)	1.181*** (0.293)	1.427*** (0.464)	1.299*** (0.421)	1.494 (1.024)	1.992 (2.021)
temp	-0.045 (0.936)	76.237 (145.099)			-7.836 (8.449)	0.190 (1.121)	147.288 (344.682)	243.028 (614.230)
temp2		-1.551 (2.947)					-2.979 (6.972)	-5.534 (13.396)
pluvio			-0.000 (0.003)	0.083 (0.076)	-0.124 (0.129)	-0.001 (0.004)	0.078 (0.161)	-0.268 (0.547)
pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					0.005 (0.005)			0.019 (0.034)
SR								
D.Log_lab_Mais	-0.062 (0.146)	-0.081 (0.147)	-0.112 (0.154)	-0.099 (0.163)	-0.109 (0.166)	-0.106 (0.166)	-0.081 (0.170)	-0.101 (0.167)
LD.Log_lab_Mais	0.154 (0.148)	0.143 (0.150)	0.174 (0.149)	0.206 (0.159)	0.148 (0.162)	0.160 (0.162)	0.158 (0.173)	0.150 (0.170)
D.Log_Terre_Mais	-0.663 (2.530)	-0.734 (2.742)	-1.014 (2.635)	-1.535 (2.723)	-0.819 (2.832)	-1.300 (2.802)	-3.196 (3.061)	-1.783 (3.187)
LD.Log_Terre_Mais	0.866 (2.561)	2.625 (2.766)	1.104 (2.592)	0.472 (2.738)	0.507 (2.848)	1.228 (2.772)	3.296 (3.110)	1.653 (3.292)
L2D.Log_Terre_Mais	2.599 (2.630)	3.166 (2.876)	2.230 (2.654)	1.567 (2.798)	3.169 (2.950)	2.713 (2.925)	3.460 (3.189)	3.570 (3.136)
D.Log_Fertilisants_Mais	-0.071 (0.090)	-0.040 (0.095)	-0.005 (0.089)	-0.033 (0.101)	-0.002 (0.113)	-0.015 (0.113)	0.027 (0.123)	0.056 (0.123)
D.log_Capital	-0.350 (0.393)	-0.335 (0.399)	-0.530 (0.392)	-0.525 (0.403)	-0.618 (0.457)	-0.461 (0.434)	-0.338 (0.432)	-0.637 (0.480)
D.temp	0.032 (0.170)	-20.013 (18.385)			-0.004 (0.198)	-0.009 (0.199)	-23.370 (20.997)	-30.545 (21.318)
LD.temp	0.025 (0.129)	-23.323 (14.730)			0.030 (0.144)	0.016 (0.144)	-27.913 (16.911)	-30.853* (16.766)
L2D.temp	0.083 (0.092)	-8.591 (10.727)			0.064 (0.105)	0.064 (0.106)	-7.483 (11.994)	-8.911 (11.837)
D.temp2		0.407 (0.373)					0.473 (0.426)	0.619 (0.432)
LD.temp2		0.473 (0.299)					0.567 (0.343)	0.627* (0.340)
L2D.temp2		0.176 (0.218)					0.154 (0.243)	0.183 (0.240)
D.pluvio			-0.000 (0.001)	-0.018 (0.013)	0.000 (0.001)	0.000 (0.001)	-0.013 (0.015)	-0.018 (0.015)
LD.pluvio			0.000 (0.001)	-0.011 (0.011)	0.000 (0.001)	0.000 (0.001)	-0.004 (0.012)	-0.007 (0.012)
L2D.pluvio			0.000 (0.000)	-0.004 (0.008)	0.000 (0.000)	0.000 (0.000)	0.004 (0.010)	0.001 (0.010)
L3D.pluvio			0.000 (0.000)	-0.001 (0.005)	0.000 (0.000)	0.000 (0.000)	0.002 (0.006)	0.003 (0.006)
D.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
LD.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
L2D.pluvio2				0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
L3D.pluvio2				0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
Constant	19.840 (12.545)	-174.834 (286.382)	22.306 (13.725)	8.493 (18.327)	69.853 (48.134)	21.195 (15.383)	-243.212 (363.928)	-250.609 (357.760)
Observations	55	55	54	54	54	54	54	54
R-squared	0.312	0.385	0.330	0.402	0.369	0.345	0.558	0.591

Table A12: Effect of climate change on the production of vegetables

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Legumes	-0.173* (0.095)	-0.232* (0.117)	-0.158* (0.085)	-0.115 (0.084)	-0.158 (0.094)	-0.158 (0.094)	-0.227 (0.144)	-0.234 (0.146)
LR								
Log_lab_legumes	-0.045 (0.368)	-0.090 (0.287)	0.009 (0.266)	-0.282 (0.392)	-0.073 (0.440)	-0.074 (0.437)	-0.374 (0.284)	-0.417 (0.283)
Log_Terre_legumes	-9.913 (6.292)	-7.591 (5.197)	-8.262 (8.467)	-6.483 (9.555)	-4.643 (9.202)	-7.509 (8.814)	-2.841 (6.438)	-4.205 (6.891)
Log_Fertilisants_legumes	-0.142 (0.578)	-0.026 (0.429)	-0.399 (0.526)	-0.140 (0.782)	-0.383 (0.751)	-0.279 (0.700)	0.270 (0.458)	0.411 (0.462)
log_Capital	1.575** (0.582)	1.316*** (0.466)	1.397*** (0.436)	1.209** (0.533)	1.298** (0.600)	1.443** (0.594)	0.838* (0.426)	0.881* (0.427)
temp	-0.654 (1.305)	-79.713 (82.620)			9.356 (12.001)	-0.299 (1.558)	-100.297 (77.052)	-105.216 (75.028)
temp2		1.607 (1.679)					2.033 (1.559)	2.023 (1.531)
pluvio			-0.000 (0.005)	0.154 (0.122)	0.148 (0.179)	0.000 (0.005)	0.125 (0.077)	0.055 (0.123)
pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					-0.006 (0.007)			0.003 (0.005)
SR								
D.Log_lab_legumes	0.293* (0.152)	0.310* (0.157)	0.196 (0.148)	0.233* (0.128)	0.188 (0.159)	0.184 (0.159)	0.232 (0.143)	0.223 (0.145)
LD.Log_lab_legumes	-0.283* (0.159)	-0.264 (0.169)	-0.256* (0.145)	-0.248* (0.129)	-0.227 (0.159)	-0.236 (0.159)	-0.183 (0.166)	-0.179 (0.168)
D.Log_Terre_legumes	-0.504 (2.635)	-1.833 (2.971)	-2.094 (2.532)	-2.457 (2.155)	-2.363 (2.734)	-1.900 (2.686)	-3.646 (2.602)	-2.974 (2.834)
LD.Log_Terre_legumes	2.310 (2.678)	2.281 (2.976)	3.185 (2.496)	2.554 (2.136)	3.419 (2.724)	2.834 (2.649)	2.510 (2.718)	1.753 (2.993)
L2D.Log_Terre_legumes	-0.420 (2.760)	-0.040 (3.061)	-0.703 (2.564)	-2.162 (2.187)	-1.540 (2.828)	-1.113 (2.788)	-2.285 (2.702)	-2.240 (2.738)
D.Log_Fertilisants_legumes	-0.046 (0.094)	-0.022 (0.102)	0.064 (0.085)	0.099 (0.081)	0.049 (0.109)	0.059 (0.109)	0.107 (0.114)	0.113 (0.116)
D.log_Capital	-0.305 (0.403)	-0.329 (0.418)	-0.254 (0.368)	-0.279 (0.313)	-0.100 (0.436)	-0.243 (0.409)	-0.416 (0.362)	-0.558 (0.428)
D.temp	0.058 (0.182)	15.693 (19.017)			-0.041 (0.199)	-0.035 (0.199)	16.644 (19.596)	15.900 (19.883)
LD.temp	-0.009 (0.137)	2.010 (15.984)			-0.049 (0.143)	-0.036 (0.142)	2.880 (16.244)	3.199 (16.461)
L2D.temp	0.035 (0.096)	-0.085 (11.846)			-0.025 (0.101)	-0.025 (0.101)	1.309 (11.166)	1.418 (11.312)
D.temp2		-0.317 (0.386)					-0.337 (0.397)	-0.322 (0.403)
LD.temp2		-0.041 (0.324)					-0.058 (0.329)	-0.064 (0.333)
L2D.temp2		0.002 (0.240)					-0.027 (0.226)	-0.030 (0.229)
D.pluvio			-0.001 (0.001)	-0.006 (0.012)	-0.001 (0.001)	-0.001 (0.001)	-0.015 (0.015)	-0.017 (0.016)
LD.pluvio			-0.000 (0.001)	0.004 (0.010)	-0.000 (0.001)	-0.000 (0.001)	-0.002 (0.013)	-0.004 (0.013)
L2D.pluvio			-0.000 (0.000)	0.002 (0.007)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.009)	-0.003 (0.009)
L3D.pluvio			-0.000 (0.000)	0.002 (0.004)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.005)	0.001 (0.005)
D.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
LD.pluvio2				-0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
L2D.pluvio2				-0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
L3D.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
Constant	18.633 (13.978)	245.377 (278.709)	12.560 (13.305)	-6.581 (14.142)	-29.670 (46.820)	12.348 (15.211)	264.048 (310.311)	303.460 (320.205)
Observations	55	55	54	54	54	54	54	54
R-squared	0.338	0.375	0.459	0.674	0.490	0.475	0.725	0.730

Table A13: Effect of climate change on the production of coffee

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Cafe_The	-0.721*** (0.265)	-0.723** (0.285)	-0.807*** (0.262)	-0.711** (0.263)	-0.769** (0.299)	-0.764** (0.292)	-0.568* (0.313)	-0.564 (0.328)
LR								
Log_lab_cafe_the	0.238* (0.122)	0.225* (0.132)	0.209** (0.078)	0.224** (0.107)	0.298** (0.127)	0.297** (0.125)	0.285 (0.179)	0.288 (0.187)
Log_Terre_cafe_the	0.582 (2.096)	1.005 (2.231)	-0.862 (2.736)	-0.184 (2.826)	-1.666 (3.236)	-1.587 (3.118)	-2.125 (4.682)	-2.064 (4.900)
Log_Fertilisants_cafe_the	0.023 (0.166)	0.017 (0.173)	0.071 (0.127)	0.008 (0.172)	-0.064 (0.171)	-0.067 (0.167)	-0.106 (0.247)	-0.115 (0.291)
log_Capital	-0.458** (0.181)	-0.475** (0.195)	-0.355*** (0.113)	-0.347** (0.132)	-0.434** (0.189)	-0.438** (0.183)	-0.426 (0.286)	-0.427 (0.296)
temp	0.185 (0.427)	-9.832 (36.468)			0.074 (3.060)	0.443 (0.445)	12.589 (46.202)	12.827 (47.815)
temp2		0.203 (0.741)					-0.245 (0.936)	-0.242 (0.966)
pluvio			-0.001 (0.001)	-0.006 (0.029)	-0.008 (0.046)	-0.002 (0.002)	0.017 (0.044)	0.021 (0.086)
pluvio2				0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					0.000 (0.002)			-0.000 (0.004)
SR								
LD.Ind_prod_Cafe_The	-0.307* (0.181)	-0.308 (0.193)	-0.227 (0.178)	-0.143 (0.181)	-0.273 (0.204)	-0.278 (0.196)	-0.184 (0.210)	-0.187 (0.221)
D.Log_lab_cafe_the	-0.105 (0.204)	-0.103 (0.215)	-0.036 (0.225)	-0.064 (0.214)	-0.099 (0.229)	-0.099 (0.226)	-0.113 (0.224)	-0.111 (0.231)
LD.Log_lab_cafe_the	-0.012 (0.213)	0.011 (0.225)	-0.089 (0.221)	0.003 (0.213)	-0.081 (0.233)	-0.077 (0.228)	0.041 (0.233)	0.042 (0.239)
D.Log_Terre_cafe_the	-6.265* (3.405)	-5.224 (4.089)	-5.633 (3.750)	-5.884 (3.524)	-6.437 (3.847)	-6.515* (3.731)	-7.542* (4.154)	-7.661 (4.611)
LD.Log_Terre_cafe_the	-4.377 (3.732)	-4.901 (4.215)	-4.795 (3.994)	-3.362 (3.920)	-4.130 (4.109)	-4.050 (3.990)	-0.961 (4.503)	-0.840 (4.953)
L2D.Log_Terre_cafe_the	6.105 (3.769)	5.176 (4.297)	4.573 (3.983)	4.573 (3.808)	7.621* (4.210)	7.578* (4.128)	7.466 (4.485)	7.482 (4.597)
D.Log_Fertilisants_cafe_the	-0.004 (0.126)	-0.026 (0.138)	-0.007 (0.130)	0.066 (0.132)	0.031 (0.158)	0.029 (0.154)	0.097 (0.159)	0.095 (0.165)
D.log_Capital	-0.776 (0.519)	-0.775 (0.553)	-0.882 (0.564)	-0.753 (0.541)	-0.840 (0.608)	-0.817 (0.567)	-0.774 (0.575)	-0.752 (0.681)
D.temp	-0.131 (0.259)	-0.474 (22.266)			-0.254 (0.300)	-0.253 (0.295)	-6.950 (21.497)	-6.659 (22.432)
LD.temp	0.084 (0.204)	5.412 (19.415)			0.013 (0.223)	0.013 (0.220)	-1.142 (19.104)	-1.081 (19.573)
L2D.temp	0.086 (0.142)	7.801 (15.308)			0.087 (0.160)	0.089 (0.157)	-3.244 (15.442)	-3.215 (15.810)
D.temp2		0.006 (0.452)					0.139 (0.436)	0.133 (0.455)
LD.temp2		-0.108 (0.394)					0.027 (0.387)	0.026 (0.397)
L2D.temp2		-0.157 (0.311)					0.067 (0.313)	0.066 (0.320)
D.pluvio			0.001 (0.001)	0.017 (0.018)	0.002 (0.001)	0.002 (0.001)	0.007 (0.020)	0.008 (0.022)
LD.pluvio			0.001 (0.001)	0.010 (0.015)	0.001 (0.001)	0.001 (0.001)	0.006 (0.018)	0.006 (0.018)
L2D.pluvio			0.001 (0.001)	0.009 (0.011)	0.001 (0.001)	0.001 (0.001)	0.005 (0.013)	0.006 (0.014)
L3D.pluvio			0.000 (0.000)	-0.001 (0.007)	0.000 (0.000)	0.000 (0.000)	-0.007 (0.009)	-0.007 (0.009)
D.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
LD.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
L2D.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
L3D.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
Constant	-2.464 (16.084)	84.430 (314.533)	10.885 (16.850)	8.683 (21.912)	16.018 (65.037)	8.494 (19.343)	-84.617 (322.002)	-88.046 (333.533)
Observations	55	55	54	54	54	54	54	54
R-squared	0.625	0.633	0.603	0.706	0.666	0.666	0.782	0.782

Table A14: Effect of climate change on cocoa production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Cacao	-0.270** (0.105)	-0.168 (0.113)	-0.323*** (0.110)	-0.392*** (0.106)	-0.300** (0.119)	-0.300** (0.117)	-0.288** (0.128)	-0.310** (0.125)
LR								
Log_lab_cacao	-0.228 (0.223)	-0.248 (0.342)	-0.099 (0.130)	0.175 (0.139)	-0.124 (0.227)	-0.124 (0.224)	0.132 (0.237)	0.189 (0.225)
Log_Terre_cacao	-5.461 (3.808)	-9.381 (8.242)	-5.960 (4.099)	-5.559* (3.105)	-6.885 (4.809)	-6.888 (4.460)	-7.616 (5.611)	-4.694 (4.973)
Log_Fertilisants_cacao	0.281 (0.305)	0.317 (0.468)	0.258 (0.208)	-0.175 (0.223)	0.219 (0.304)	0.219 (0.294)	-0.221 (0.343)	-0.421 (0.370)
log_Capital	0.950** (0.391)	1.296 (0.845)	0.736*** (0.187)	0.916*** (0.168)	0.860** (0.361)	0.860** (0.343)	1.352** (0.510)	1.209*** (0.428)
temp	-0.552 (0.837)	-8.370 (100.593)			-0.168 (5.368)	-0.180 (0.838)	-12.391 (60.390)	-8.369 (54.972)
temp2		0.153 (2.048)					0.236 (1.225)	0.345 (1.098)
pluvio			-0.002 (0.002)	-0.122*** (0.042)	-0.002 (0.081)	-0.002 (0.003)	-0.160** (0.073)	-0.035 (0.091)
pluvio2				0.000*** (0.000)			0.000** (0.000)	0.000** (0.000)
temp_pluvio					-0.000 (0.003)			-0.006 (0.004)
SR								
D.Log_lab_cacao	0.060 (0.144)	0.094 (0.137)	0.054 (0.151)	0.101 (0.142)	0.057 (0.157)	0.057 (0.155)	0.158 (0.145)	0.178 (0.141)
LD.Log_lab_cacao	0.142 (0.146)	0.117 (0.141)	0.157 (0.147)	0.075 (0.139)	0.148 (0.155)	0.148 (0.152)	0.050 (0.150)	0.057 (0.146)
D.Log_Terre_cacao	-1.817 (2.485)	-2.669 (2.680)	-2.231 (2.587)	-1.745 (2.374)	-3.069 (2.692)	-3.068 (2.616)	-2.844 (2.705)	-4.159 (2.775)
LD.Log_Terre_cacao	4.987* (2.490)	3.427 (2.577)	5.671** (2.492)	7.297*** (2.358)	5.989** (2.670)	5.987** (2.554)	6.004** (2.642)	7.669** (2.799)
L2D.Log_Terre_cacao	1.818 (2.639)	0.750 (2.697)	2.075 (2.683)	4.625* (2.584)	2.661 (2.997)	2.662 (2.928)	3.370 (2.919)	3.420 (2.841)
D.Log_Fertilisants_cacao	-0.111 (0.090)	-0.109 (0.091)	-0.024 (0.089)	0.053 (0.088)	-0.055 (0.107)	-0.055 (0.105)	-0.033 (0.102)	-0.054 (0.100)
D.log_Capital	0.122 (0.384)	0.209 (0.369)	0.113 (0.396)	0.076 (0.363)	0.080 (0.435)	0.080 (0.406)	0.093 (0.372)	0.384 (0.411)
D.temp	0.215 (0.169)	18.583 (14.289)			0.138 (0.199)	0.138 (0.196)	14.866 (13.784)	18.290 (13.609)
LD.temp	0.215* (0.127)	20.461 (12.595)			0.178 (0.141)	0.178 (0.138)	15.791 (12.364)	16.542 (12.046)
L2D.temp	0.149 (0.091)	6.406 (9.969)			0.121 (0.101)	0.121 (0.100)	8.817 (9.926)	9.568 (9.676)
D.temp2		-0.372 (0.290)					-0.296 (0.280)	-0.366 (0.276)
LD.temp2		-0.410 (0.256)					-0.315 (0.251)	-0.331 (0.244)
L2D.temp2		-0.127 (0.202)					-0.175 (0.201)	-0.189 (0.196)
D.pluvio			0.000 (0.001)	0.039*** (0.012)	0.000 (0.001)	0.000 (0.001)	0.036** (0.014)	0.042*** (0.014)
LD.pluvio			0.000 (0.001)	0.028*** (0.010)	0.000 (0.001)	0.000 (0.001)	0.029** (0.012)	0.032** (0.012)
L2D.pluvio			0.000 (0.000)	0.016** (0.007)	0.000 (0.000)	0.000 (0.000)	0.016* (0.009)	0.020** (0.009)
L3D.pluvio			-0.000 (0.000)	0.009** (0.004)	-0.000 (0.000)	-0.000 (0.000)	0.008 (0.005)	0.007 (0.005)
D.pluvio2				-0.000*** (0.000)			-0.000** (0.000)	-0.000*** (0.000)
LD.pluvio2				-0.000*** (0.000)			-0.000** (0.000)	-0.000** (0.000)
L2D.pluvio2				-0.000** (0.000)			-0.000* (0.000)	-0.000** (0.000)
L3D.pluvio2				-0.000** (0.000)			-0.000 (0.000)	-0.000 (0.000)
Constant	16.373 (11.141)	32.611 (209.385)	17.618 (13.616)	56.745*** (16.948)	20.122 (45.383)	20.221 (14.015)	101.528 (218.161)	54.098 (214.697)
Observations	55	55	54	54	54	54	54	54
R-squared	0.375	0.499	0.399	0.573	0.470	0.470	0.698	0.726

Table A15: Effect of climate change on banana production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Bananes	-0.284** (0.137)	-0.278* (0.146)	-0.310** (0.119)	-0.322** (0.127)	-0.300** (0.128)	-0.307** (0.126)	-0.316** (0.148)	-0.319** (0.152)
LR								
Log_lab_banane	0.108 (0.224)	0.076 (0.230)	0.216 (0.149)	0.241 (0.167)	0.223 (0.221)	0.215 (0.211)	0.181 (0.219)	0.186 (0.225)
Log_Terre_banane	2.943 (3.294)	4.104 (3.482)	0.773 (3.286)	1.313 (3.226)	1.489 (3.717)	0.765 (3.533)	3.731 (4.034)	4.019 (4.348)
Log_Fertilisants_banane	-0.237 (0.274)	-0.261 (0.292)	-0.260 (0.166)	-0.374* (0.215)	-0.275 (0.246)	-0.243 (0.229)	-0.352 (0.270)	-0.375 (0.304)
log_Capital	0.564** (0.269)	0.504* (0.294)	0.576*** (0.141)	0.613*** (0.152)	0.529** (0.232)	0.569** (0.218)	0.570** (0.274)	0.561* (0.281)
temp	-0.188 (0.659)	-41.568 (60.069)			2.711 (4.319)	0.007 (0.585)	-26.800 (50.922)	-25.698 (51.673)
temp2		0.841 (1.222)					0.541 (1.033)	0.540 (1.045)
pluvio			-0.002 (0.002)	-0.025 (0.034)	0.039 (0.065)	-0.002 (0.002)	-0.028 (0.043)	-0.014 (0.082)
pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
temp_pluvio					-0.002 (0.003)			-0.001 (0.003)
SR								
D.Log_lab_banane	0.097 (0.127)	0.106 (0.131)	0.196* (0.110)	0.213* (0.116)	0.186 (0.120)	0.183 (0.119)	0.207 (0.131)	0.208 (0.135)
LD.Log_lab_banane	-0.036 (0.129)	-0.010 (0.133)	-0.021 (0.106)	-0.068 (0.113)	-0.003 (0.118)	-0.007 (0.117)	-0.016 (0.132)	-0.016 (0.135)
D.Log_Terre_banane	0.916 (2.080)	2.076 (2.396)	0.064 (1.785)	0.152 (1.833)	-0.167 (1.955)	0.083 (1.903)	1.576 (2.290)	1.407 (2.504)
LD.Log_Terre_banane	2.521 (2.182)	1.406 (2.447)	3.499* (1.792)	4.095** (1.909)	3.692* (2.002)	3.389* (1.934)	3.128 (2.417)	3.330 (2.693)
L2D.Log_Terre_banane	1.699 (2.232)	0.477 (2.496)	2.534 (1.869)	2.604 (2.001)	2.154 (2.125)	2.407 (2.074)	1.215 (2.533)	1.214 (2.588)
D.Log_Fertilisants_banane	0.057 (0.078)	0.022 (0.083)	0.063 (0.064)	0.066 (0.072)	0.065 (0.081)	0.071 (0.080)	0.032 (0.092)	0.030 (0.094)
D.log_Capital	0.094 (0.323)	0.102 (0.333)	0.130 (0.269)	0.156 (0.275)	0.193 (0.322)	0.114 (0.297)	0.172 (0.321)	0.207 (0.377)
D.temp	-0.009 (0.152)	5.034 (13.517)			-0.041 (0.143)	-0.037 (0.141)	-0.980 (12.578)	-0.641 (12.975)
LD.temp	0.026 (0.113)	13.095 (11.950)			-0.023 (0.103)	-0.015 (0.102)	9.239 (11.361)	9.243 (11.607)
L2D.temp	-0.003 (0.080)	10.927 (9.268)			-0.031 (0.075)	-0.031 (0.074)	7.424 (8.735)	7.455 (8.926)
D.temp2		-0.103 (0.275)					0.020 (0.255)	0.013 (0.264)
LD.temp2		-0.265 (0.243)					-0.187 (0.231)	-0.187 (0.236)
L2D.temp2		-0.222 (0.188)					-0.151 (0.177)	-0.152 (0.181)
D.pluvio			0.000 (0.001)	0.006 (0.010)	0.000 (0.001)	0.000 (0.001)	0.008 (0.012)	0.008 (0.013)
LD.pluvio			0.000 (0.000)	0.006 (0.008)	0.000 (0.000)	0.000 (0.000)	0.007 (0.010)	0.007 (0.010)
L2D.pluvio			-0.000 (0.000)	-0.001 (0.006)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.008)	0.001 (0.008)
L3D.pluvio			-0.000* (0.000)	-0.001 (0.003)	-0.000* (0.000)	-0.000 (0.000)	-0.001 (0.004)	-0.001 (0.005)
D.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
LD.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
L2D.pluvio2				0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
L3D.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
Constant	-5.586 (10.484)	133.724 (187.707)	-1.090 (8.812)	3.162 (11.824)	-22.942 (33.714)	-1.121 (9.843)	102.174 (183.219)	94.593 (191.461)
Observations	55	55	54	54	54	54	54	54
R-squared	0.263	0.316	0.502	0.555	0.515	0.508	0.613	0.614

Table A16: Effect of climate change on millet production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Mil_Sorgho	-0.489** (0.183)	-0.566** (0.218)	-0.382** (0.166)	-0.308* (0.154)	-0.360* (0.178)	-0.361** (0.176)	-0.286 (0.225)	-0.333 (0.223)
LR								
Log_lab_Mil_sorgho	-0.004 (0.241)	-0.051 (0.220)	0.006 (0.206)	0.135 (0.329)	0.192 (0.400)	0.182 (0.390)	-0.153 (0.435)	0.233 (0.563)
Log_Terre_Mil_sorgho	-5.337 (4.219)	-3.398 (4.092)	-10.036 (7.636)	-10.906 (8.995)	-10.446 (9.154)	-11.329 (9.003)	-5.004 (13.285)	-7.211 (12.876)
Log_Fertilisants_Mil_sorgho	-0.106 (0.331)	-0.110 (0.296)	0.040 (0.296)	-0.036 (0.434)	-0.157 (0.472)	-0.110 (0.445)	0.197 (0.545)	-0.411 (0.638)
log_Capital	0.627* (0.347)	0.519 (0.334)	0.865** (0.331)	0.930** (0.420)	0.673 (0.471)	0.725 (0.451)	0.722 (0.747)	0.690 (0.628)
temp	0.413 (0.857)	-40.751 (62.629)			3.865 (8.594)	0.681 (1.256)	-93.147 (100.592)	-6.673 (117.530)
temp2		0.835 (1.272)					1.881 (2.040)	0.306 (2.313)
pluvio			-0.000 (0.003)	-0.015 (0.074)	0.046 (0.127)	-0.002 (0.004)	0.013 (0.107)	0.099 (0.176)
pluvio2				0.000 (0.000)			-0.000 (0.000)	0.000 (0.000)
temp_pluvio					-0.002 (0.005)			-0.005 (0.007)
SR								
LD.Ind_prod_Mil_Sorgho	-0.310* (0.170)	-0.264 (0.189)	-0.436** (0.171)	-0.460** (0.177)	-0.479** (0.190)	-0.484** (0.187)	-0.457** (0.220)	-0.469** (0.217)
L2D.Ind_prod_Mil_Sorgho	-0.454*** (0.145)	-0.435*** (0.155)	-0.374** (0.152)	-0.244 (0.164)	-0.468** (0.193)	-0.449** (0.184)	-0.194 (0.235)	-0.284 (0.235)
D.Log_lab_Mil_sorgho	-0.186 (0.275)	-0.164 (0.289)	-0.319 (0.252)	-0.143 (0.234)	-0.273 (0.277)	-0.278 (0.273)	-0.146 (0.274)	-0.096 (0.269)
LD.Log_lab_Mil_sorgho	-0.073 (0.284)	-0.042 (0.299)	-0.016 (0.250)	-0.101 (0.232)	-0.087 (0.283)	-0.092 (0.278)	-0.008 (0.286)	-0.140 (0.289)
D.Log_Terre_Mil_sorgho	3.558 (4.717)	3.088 (5.446)	4.715 (4.279)	2.485 (3.899)	4.810 (4.658)	5.135 (4.516)	3.349 (4.751)	-0.082 (5.108)
LD.Log_Terre_Mil_sorgho	7.155 (4.991)	7.655 (5.537)	4.263 (4.376)	4.975 (4.012)	5.806 (5.053)	5.248 (4.773)		9.140 (5.378)
L2D.Log_Terre_Mil_sorgho	8.256 (5.195)	8.312 (5.802)	6.330 (4.505)	5.626 (4.164)	6.534 (5.126)	6.760 (5.020)		6.793 (5.123)
D.Log_Fertilisants_Mil_sorgho	0.051 (0.176)	0.066 (0.193)	0.067 (0.149)	0.159 (0.147)	0.109 (0.189)	0.117 (0.185)	0.117 (0.197)	0.171 (0.198)
D.log_Capital	-0.076 (0.716)	-0.095 (0.746)	-0.742 (0.629)	-0.580 (0.572)	-0.565 (0.763)	-0.682 (0.690)	-0.708 (0.652)	-0.331 (0.759)
D.temp	-0.074 (0.319)	7.849 (32.248)			-0.077 (0.329)	-0.070 (0.324)	9.735 (27.997)	-2.137 (29.185)
LD.temp	-0.118 (0.241)	-3.022 (27.510)			-0.119 (0.240)	-0.106 (0.235)	9.194 (23.476)	-10.392 (25.533)
L2D.temp	-0.023 (0.172)	4.638 (20.891)			-0.058 (0.174)	-0.061 (0.172)	14.791 (17.997)	0.277 (19.336)
D.temp2		-0.161 (0.655)					-0.194 (0.569)	0.044 (0.592)
LD.temp2		0.058 (0.558)					-0.182 (0.476)	0.213 (0.517)
L2D.temp2		-0.095 (0.424)					-0.298 (0.364)	-0.004 (0.392)
D.pluvio			0.001 (0.001)	0.004 (0.019)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.025)	0.006 (0.025)
LD.pluvio			0.002* (0.001)	0.022 (0.016)	0.002* (0.001)	0.002* (0.001)	0.021 (0.021)	0.026 (0.021)
L2D.pluvio			0.001 (0.001)	0.016 (0.012)	0.001 (0.001)	0.001 (0.001)	0.017 (0.017)	0.020 (0.017)
L3D.pluvio			0.000 (0.000)	0.003 (0.007)	0.000 (0.001)	0.000 (0.000)	0.002 (0.010)	0.000 (0.010)
D.pluvio2				-0.000 (0.000)			0.000 (0.000)	-0.000 (0.000)
LD.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
L2D.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
L3D.pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
Constant	21.119 (22.241)	301.336 (470.641)	37.042 (22.681)	35.686 (26.882)	3.163 (85.217)	34.557 (24.885)	339.243 (467.736)	22.464 (484.621)
Observations	55	55	54	54	54	54	54	54
R-squared	0.564	0.585	0.682	0.782	0.695	0.693	0.786	0.823

Table A17: Effect of climate change on oilseed production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Oleagineux	-0.267*** (0.084)	-0.387*** (0.111)	-0.283*** (0.088)	-0.264*** (0.094)	-0.299*** (0.089)	-0.284*** (0.090)	-0.300** (0.140)	-0.322** (0.136)
LR								
Log_lab_oleagineux	-0.072 (0.228)	-0.144 (0.155)	-0.192 (0.162)	-0.315 (0.251)	0.010 (0.238)	0.032 (0.256)	-0.226 (0.247)	-0.164 (0.253)
Log_Terre_oleagineux	-7.427* (3.744)	-5.474* (2.732)	-11.939** (5.160)	-11.821* (5.810)	-13.345** (5.166)	-11.270** (5.151)	-8.617 (6.852)	-14.645* (8.202)
Log_Fertilisants_oleagineux	-0.007 (0.331)	0.075 (0.219)	0.131 (0.259)	0.284 (0.393)	0.003 (0.323)	-0.078 (0.346)	0.260 (0.357)	0.369 (0.396)
log_Capital	1.085*** (0.334)	0.946*** (0.240)	1.477*** (0.256)	1.413*** (0.291)	1.263*** (0.329)	1.119*** (0.334)	0.763 (0.446)	0.976** (0.387)
temp	0.794 (0.909)	-84.472* (49.432)			-7.230 (6.128)	1.145 (0.998)	-93.770 (77.790)	-37.881 (84.133)
temp2		1.724* (1.003)					1.928 (1.569)	0.523 (1.787)
pluvio			-0.003 (0.003)	0.050 (0.070)	-0.130 (0.094)	-0.004 (0.003)	0.080 (0.089)	-0.102 (0.120)
pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					0.005 (0.004)			0.008 (0.006)
SR								
LD.Ind_prod_Oleagineux	-0.360** (0.150)	-0.296* (0.162)	-0.305* (0.157)	-0.312* (0.167)	-0.443** (0.173)	-0.354** (0.163)	-0.347 (0.203)	-0.500** (0.211)
L2D.Ind_prod_Oleagineux							-0.151 (0.244)	
D.Log_lab_oleagineux	0.135 (0.148)	0.160 (0.145)	0.171 (0.161)	0.176 (0.174)	0.144 (0.164)	0.156 (0.166)	0.148 (0.187)	0.108 (0.178)
LD.Log_lab_oleagineux	0.065 (0.158)	0.111 (0.158)	0.095 (0.160)	0.109 (0.173)	0.097 (0.168)	0.089 (0.170)	0.157 (0.204)	0.117 (0.193)
D.Log_Terre_oleagineux	4.160 (2.636)	2.010 (2.742)	3.469 (2.842)	3.158 (2.981)	5.554* (3.004)	4.246 (2.895)	1.923 (3.456)	4.125 (3.589)
LD.Log_Terre_oleagineux	2.798 (2.646)	3.303 (2.702)	2.812 (2.804)	2.532 (3.064)	2.100 (2.897)	3.064 (2.855)		1.216 (3.532)
L2D.Log_Terre_oleagineux	1.329 (2.739)	3.004 (2.869)	2.158 (2.924)	1.293 (3.211)	3.315 (3.065)	2.489 (3.052)		4.409 (3.479)
D.Log_Fertilisants_oleagineux	-0.087 (0.093)	-0.081 (0.096)	-0.146 (0.097)	-0.171 (0.113)	-0.058 (0.113)	-0.060 (0.115)	-0.065 (0.143)	-0.047 (0.130)
D.log_Capital	-0.337 (0.390)	-0.357 (0.380)	-0.399 (0.406)	-0.364 (0.425)	-0.540 (0.463)	-0.279 (0.429)	-0.193 (0.467)	-0.716 (0.525)
D.temp	-0.237 (0.176)	20.415 (19.133)			-0.333 (0.197)	-0.329 (0.200)	19.706 (22.860)	2.745 (22.691)
LD.temp	-0.209 (0.131)	2.394 (16.041)			-0.253* (0.142)	-0.269* (0.144)	7.342 (19.388)	-8.861 (18.957)
L2D.temp	-0.128 (0.095)	-4.423 (11.532)			-0.171 (0.105)	-0.161 (0.106)	-1.953 (13.908)	-15.321 (14.039)
D.temp2		-0.418 (0.388)					-0.407 (0.463)	-0.064 (0.460)
LD.temp2		-0.052 (0.325)					-0.155 (0.393)	0.174 (0.384)
L2D.temp2		0.087 (0.234)					0.036 (0.282)	0.306 (0.284)
D.pluvio			0.001 (0.001)	-0.010 (0.014)	0.001 (0.001)	0.001 (0.001)	-0.020 (0.017)	-0.026 (0.017)
LD.pluvio			0.000 (0.001)	-0.006 (0.012)	0.001 (0.001)	0.001 (0.001)	-0.016 (0.014)	-0.018 (0.014)
L2D.pluvio			0.000 (0.000)	-0.003 (0.008)	0.000 (0.000)	0.000 (0.000)	-0.009 (0.011)	-0.013 (0.011)
L3D.pluvio			0.000 (0.000)	-0.004 (0.005)	0.000 (0.000)	0.000 (0.000)	-0.005 (0.007)	-0.004 (0.006)
D.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
LD.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
L2D.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
L3D.pluvio2				0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
Constant	9.192 (11.252)	416.378 (297.785)	25.603** (12.384)	12.941 (18.747)	84.739 (50.424)	17.232 (13.726)	343.558 (396.929)	209.032 (378.353)
Observations	55	55	54	54	54	54	54	54
R-squared	0.426	0.521	0.402	0.442	0.502	0.470	0.555	0.636

Table A18: Effect of climate change on rice production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Riz paddy	-0.337** (0.144)	-0.623*** (0.171)	-0.328** (0.145)	-0.337** (0.152)	-0.251 (0.162)	-0.340** (0.156)	-0.567** (0.257)	-0.585** (0.226)
LR								
Log_lab_riz	-0.658 (0.424)	-0.848*** (0.194)	-0.020 (0.381)	-0.280 (0.412)	-0.332 (0.682)	-0.417 (0.504)	-0.870*** (0.293)	-0.787** (0.289)
Log_Terre_riz	0.693 (8.966)	12.583*** (3.662)	-6.976 (12.808)	-7.995 (13.101)	-4.808 (16.517)	-6.479 (12.935)	13.393* (6.771)	14.867** (6.669)
Log_Fertilisants_riz	0.840 (0.600)	0.717** (0.270)	0.223 (0.523)	0.517 (0.653)	0.332 (0.941)	0.637 (0.664)	0.736* (0.367)	0.592 (0.455)
log_Capital	1.303* (0.743)	0.513 (0.329)	0.884 (0.535)	0.770 (0.526)	1.298 (1.040)	1.355 (0.801)	0.625 (0.496)	0.523 (0.453)
temp	-2.419 (1.650)	-236.919*** (57.906)			24.679 (26.972)	-1.698 (1.824)	-275.546*** (95.728)	-246.744*** (76.616)
temp2		4.776*** (1.176)					5.552*** (1.933)	5.076*** (1.578)
pluvio			-0.008 (0.006)	0.072 (0.117)	0.400 (0.417)	-0.006 (0.007)	-0.020 (0.019)	0.042 (0.145)
pluvio2				-0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
temp_pluvio					-0.016 (0.017)			-0.003 (0.006)
SR								
D.Log_lab_riz	0.186 (0.351)	0.337 (0.300)	0.331 (0.373)	0.317 (0.384)	0.268 (0.386)	0.263 (0.396)	0.446 (0.356)	0.480 (0.376)
LD.Log_lab_riz	-0.402 (0.366)	-0.086 (0.319)	-0.584 (0.372)	-0.696* (0.386)	-0.467 (0.392)	-0.450 (0.402)	-0.145 (0.388)	-0.191 (0.406)
D.Log_Terre_riz	6.043 (5.913)	5.655 (5.467)	5.046 (6.258)	5.408 (6.303)	1.784 (6.623)	4.545 (6.561)	5.729 (7.226)	3.446 (7.176)
LD.Log_Terre_riz	-0.019 (6.143)	-4.821 (5.555)	2.824 (6.242)	2.537 (6.483)	3.531 (6.549)	1.394 (6.576)	-3.716 (6.783)	-2.116 (7.514)
L2D.Log_Terre_riz	5.335 (6.194)	1.615 (5.731)	9.080 (6.293)	7.207 (6.508)	5.614 (6.817)	7.705 (6.863)	1.635 (6.840)	1.125 (7.059)
D.Log_Fertilisants_riz	-0.015 (0.223)	-0.237 (0.196)	0.171 (0.215)	0.017 (0.239)	0.016 (0.264)	0.041 (0.271)	-0.286 (0.302)	-0.311 (0.267)
D.log_Capital	-2.080** (0.890)	-1.730** (0.748)	-1.971** (0.913)	-1.945** (0.916)	-1.553 (1.049)	-2.226** (0.987)	-1.629* (0.894)	-1.227 (1.079)
D.temp	0.398 (0.424)	68.112 (41.168)			0.208 (0.473)	0.280 (0.482)	69.649 (49.762)	65.763 (48.496)
LD.temp	0.396 (0.314)	62.637** (30.552)			0.241 (0.339)	0.318 (0.344)	60.016 (42.113)	58.824 (37.088)
L2D.temp	0.101 (0.221)	32.770 (23.363)			0.098 (0.244)	0.096 (0.250)	32.620 (27.510)	32.798 (28.194)
D.temp2		-1.372 (0.834)					-1.402 (1.008)	-1.324 (0.982)
LD.temp2		-1.261** (0.620)					-1.208 (0.853)	-1.185 (0.752)
L2D.temp2		-0.661 (0.474)					-0.658 (0.558)	-0.661 (0.572)
D.pluvio			0.002 (0.002)	-0.031 (0.032)	0.001 (0.002)	0.002 (0.002)	-0.001 (0.002)	0.005 (0.034)
LD.pluvio			0.002 (0.001)	-0.026 (0.026)	0.001 (0.002)	0.001 (0.002)	-0.001 (0.001)	0.002 (0.027)
L2D.pluvio			0.001 (0.001)	-0.029 (0.019)	0.000 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.022)
L3D.pluvio			0.000 (0.001)	-0.011 (0.011)	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	0.002 (0.013)
D.pluvio2				0.000 (0.000)				-0.000 (0.000)
LD.pluvio2				0.000 (0.000)				-0.000 (0.000)
L2D.pluvio2				0.000 (0.000)				0.000 (0.000)
L3D.pluvio2				0.000 (0.000)				-0.000 (0.000)
LD.Ind_prod_Riz paddy							-0.099 (0.230)	
L2D.Ind_prod_Riz paddy							-0.095 (0.195)	
Constant	15.696 (26.269)	1769.415*** (575.049)	20.220 (27.990)	2.382 (39.039)	-143.679 (112.101)	31.515 (30.704)	1889.732** (693.406)	1704.057** (763.723)
Observations	55	55	54	54	54	54	54	54
R-squared	0.364	0.606	0.370	0.462	0.450	0.403	0.661	0.676

Table A19: Effect of climate change on tuber production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Tubercules	-0.206*** (0.074)	-0.206** (0.099)	-0.203** (0.076)	-0.190** (0.078)	-0.210** (0.078)	-0.214*** (0.078)	-0.073 (0.110)	-0.167 (0.110)
LR								
Log_lab_tubercules	0.160 (0.223)	0.146 (0.245)	-0.109 (0.149)	-0.155 (0.215)	0.239 (0.245)	0.232 (0.240)	1.390 (2.565)	0.275 (0.421)
Log_Terre_tubercules	-3.858 (3.281)	-2.482 (3.375)	-7.870 (4.675)	-7.402 (5.119)	-5.682 (4.702)	-7.600* (4.379)	-20.262 (31.688)	-3.473 (6.917)
Log_Fertilisants_tubercules	0.050 (0.278)	0.032 (0.267)	0.207 (0.245)	0.319 (0.361)	-0.229 (0.319)	-0.156 (0.301)	-0.812 (1.667)	-0.281 (0.542)
log_Capital	0.566* (0.324)	0.493 (0.331)	1.098*** (0.207)	1.039*** (0.242)	0.506 (0.348)	0.613* (0.315)	0.148 (1.261)	0.365 (0.550)
temp	1.144 (0.856)	-17.242 (68.848)			8.175 (6.181)	1.629 (0.972)	361.272 (752.250)	35.608 (122.468)
temp2		0.375 (1.391)					-7.202 (15.066)	-0.460 (2.334)
pluvio			-0.002 (0.003)	0.023 (0.059)	0.095 (0.089)	-0.004 (0.003)	0.031 (0.062)	0.169 (0.184)
pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					-0.004 (0.004)			-0.007 (0.007)
SR								
D.Log_lab_tubercules	0.273*** (0.100)	0.274*** (0.096)	0.245** (0.108)	0.222* (0.113)	0.243** (0.108)	0.238** (0.109)	0.239** (0.101)	0.215* (0.110)
LD.Log_lab_tubercules	-0.052 (0.105)	-0.041 (0.107)	-0.031 (0.108)	0.017 (0.113)	-0.053 (0.111)	-0.059 (0.111)	-0.015 (0.115)	-0.023 (0.125)
D.Log_Terre_tubercules	1.049 (1.666)	1.710 (1.792)	0.230 (1.796)	0.321 (1.833)	0.108 (1.803)	0.535 (1.787)	0.624 (1.824)	-0.145 (2.086)
LD.Log_Terre_tubercules	-0.321 (1.735)	0.106 (1.817)	-0.534 (1.797)	-1.069 (1.893)	0.619 (1.834)	0.105 (1.804)	1.732 (1.879)	1.490 (2.195)
L2D.Log_Terre_tubercules	-0.010 (1.765)	-1.034 (1.854)	-0.362 (1.843)	-0.539 (1.938)	0.185 (1.919)	0.585 (1.910)	0.025 (1.978)	-0.798 (2.070)
D.Log_Fertilisants_tubercules	-0.041 (0.062)	-0.024 (0.062)	-0.076 (0.062)	-0.057 (0.070)	-0.002 (0.074)	0.007 (0.074)	0.091 (0.075)	0.035 (0.078)
D.log_Capital	-0.286 (0.263)	-0.320 (0.255)	-0.445 (0.276)	-0.473 (0.281)	-0.189 (0.302)	-0.322 (0.285)	-0.318 (0.269)	-0.183 (0.327)
D.temp	-0.207* (0.116)	-2.290 (12.158)			-0.287** (0.130)	-0.283** (0.131)	-23.704 (14.657)	-5.017 (12.993)
LD.temp	-0.178** (0.088)	-5.848 (9.741)			-0.224** (0.094)	-0.213** (0.094)	-26.169** (12.175)	-11.968 (10.522)
L2D.temp	-0.082 (0.063)	7.361 (7.006)			-0.094 (0.070)	-0.095 (0.071)	-5.715 (8.704)	4.672 (7.545)
D.temp2		0.042 (0.247)					0.473 (0.297)	0.096 (0.264)
LD.temp2		0.114 (0.198)					0.525** (0.246)	0.238 (0.213)
L2D.temp2		-0.151 (0.142)					0.112 (0.176)	-0.097 (0.153)
D.pluvio			0.000 (0.000)	0.001 (0.009)	0.001 (0.001)	0.001 (0.001)	0.001* (0.001)	0.002 (0.010)
LD.pluvio			0.000 (0.000)	0.000 (0.008)	0.000 (0.000)	0.001 (0.000)	0.001 (0.000)	0.000 (0.008)
L2D.pluvio			0.000 (0.000)	0.003 (0.005)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.003 (0.006)
L3D.pluvio			-0.000 (0.000)	0.001 (0.003)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.004)
D.pluvio2				-0.000 (0.000)				-0.000 (0.000)
LD.pluvio2				-0.000 (0.000)				-0.000 (0.000)
L2D.pluvio2				-0.000 (0.000)				-0.000 (0.000)
L3D.pluvio2				-0.000 (0.000)				-0.000 (0.000)
LD.Ind_prod_Tubercules							-0.339* (0.197)	
L2D.Ind_prod_Tubercules							-0.162 (0.149)	
Constant	0.788 (8.179)	44.844 (187.648)	13.978 (9.756)	8.452 (12.929)	-30.553 (31.605)	7.043 (10.182)	-316.330 (225.878)	-94.521 (219.789)
Observations	55	55	54	54	54	54	54	54
R-squared	0.454	0.550	0.361	0.435	0.480	0.454	0.650	0.655

Table A20: Effect of climate change on cereal production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_autres_Cereales	-0.171 (0.109)	-0.150 (0.157)	-0.161 (0.103)	-0.163 (0.106)	-0.154 (0.112)	-0.153 (0.110)	-0.058 (0.165)	-0.071 (0.194)
LR								
Log_lab_autres_cereales	0.117 (0.409)	0.156 (0.613)	0.207 (0.361)	0.179 (0.398)	0.336 (0.599)	0.342 (0.597)	1.796 (6.291)	1.230 (4.473)
Log_Terre_autres_cereales	-15.405 (10.372)	-18.104 (20.576)	-21.640 (14.632)	-21.037 (14.656)	-23.451 (17.967)	-22.722 (17.199)	-70.850 (211.091)	-53.343 (157.135)
Log_Fertilisants_autres_cereales	0.166 (0.453)	0.153 (0.493)	0.175 (0.364)	0.215 (0.486)	0.126 (0.553)	0.090 (0.540)	-0.530 (2.528)	-0.245 (1.865)
log_Capital	1.584** (0.674)	1.896 (1.400)	1.771** (0.710)	1.687** (0.683)	1.728* (0.856)	1.689** (0.819)	4.331 (10.640)	3.522 (7.790)
temp	0.014 (1.162)	78.061 (216.693)			-2.526 (9.713)	0.453 (1.490)	476.865 (1709.969)	322.919 (1236.834)
temp2		-1.590 (4.402)					-9.661 (34.640)	-6.573 (25.189)
pluvio			-0.003 (0.004)	0.008 (0.082)	-0.049 (0.148)	-0.003 (0.005)	-0.111 (0.321)	-0.084 (0.464)
pluvio2				-0.000 (0.000)			0.000 (0.000)	0.000 (0.000)
temp_pluvio					0.002 (0.006)			0.001 (0.018)
SR								
LD.Ind_prod_autres_Cereales	-0.537*** (0.152)	-0.653*** (0.168)	-0.575*** (0.153)	-0.538*** (0.173)	-0.593*** (0.166)	-0.593*** (0.164)	-0.803*** (0.182)	-0.761*** (0.215)
L2D.Ind_prod_autres_Cereales	-0.554*** (0.140)	-0.628*** (0.144)	-0.492*** (0.144)	-0.371** (0.166)	-0.509*** (0.163)	-0.516*** (0.159)	-0.592*** (0.166)	-0.497** (0.218)
D.Log_lab_autres_cereales	-0.153 (0.132)	-0.168 (0.128)	-0.205 (0.131)	-0.160 (0.138)	-0.186 (0.143)	-0.185 (0.141)	-0.186 (0.132)	-0.167 (0.152)
LD.Log_lab_autres_cereales	-0.008 (0.138)	-0.033 (0.136)	0.015 (0.130)	-0.013 (0.137)	-0.014 (0.145)	-0.011 (0.143)	-0.115 (0.142)	-0.087 (0.163)
D.Log_Terre_autres_cereales	1.893 (2.338)	2.093 (2.422)	1.753 (2.289)	0.830 (2.396)	2.115 (2.495)	1.990 (2.426)	1.542 (2.401)	1.020 (2.896)
LD.Log_Terre_autres_cereales	0.625 (2.380)	2.442 (2.444)	0.241 (2.250)	0.663 (2.377)	0.238 (2.517)	0.420 (2.412)	3.278 (2.435)	3.081 (2.941)
L2D.Log_Terre_autres_cereales	1.694 (2.437)	2.511 (2.515)	1.963 (2.308)	2.076 (2.433)	2.001 (2.611)	1.871 (2.539)	3.251 (2.550)	3.227 (2.808)
D.Log_Fertilisants_autres_cereales	0.016 (0.086)	0.018 (0.088)	0.044 (0.078)	0.037 (0.088)	0.066 (0.100)	0.062 (0.098)	0.073 (0.100)	0.073 (0.115)
D.log_Capital	-0.168 (0.357)	-0.099 (0.352)	-0.458 (0.333)	-0.415 (0.340)	-0.467 (0.403)	-0.422 (0.371)	-0.258 (0.348)	-0.278 (0.433)
D.temp	0.019 (0.155)	-23.273 (17.919)			-0.013 (0.171)	-0.014 (0.169)	-33.236* (18.179)	-31.300 (20.730)
LD.temp	-0.041 (0.117)	-24.232 (14.429)			-0.048 (0.124)	-0.052 (0.122)	-33.687** (15.243)	-30.650* (17.354)
L2D.temp	-0.006 (0.083)	-12.598 (10.112)			-0.029 (0.091)	-0.029 (0.090)	-16.411 (10.467)	-13.892 (12.364)
D.temp2		0.473 (0.364)					0.674* (0.369)	0.635 (0.420)
LD.temp2		0.491 (0.293)					0.682** (0.309)	0.621* (0.351)
L2D.temp2		0.255 (0.205)					0.333 (0.212)	0.282 (0.250)
D.pluvio			0.001 (0.001)	-0.005 (0.011)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.015)
LD.pluvio			0.001* (0.000)	-0.000 (0.009)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.003 (0.012)
L2D.pluvio			0.001 (0.000)	0.000 (0.007)	0.001 (0.000)	0.001 (0.000)	0.001 (0.000)	0.004 (0.010)
L3D.pluvio			0.000 (0.000)	-0.002 (0.004)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.006)
D.pluvio2				0.000 (0.000)				0.000 (0.000)
LD.pluvio2				0.000 (0.000)				-0.000 (0.000)
L2D.pluvio2				0.000 (0.000)				-0.000 (0.000)
L3D.pluvio2				0.000 (0.000)				-0.000 (0.000)
Constant	19.156* (9.562)	-124.418 (275.591)	26.376** (9.720)	24.621* (14.353)	37.093 (41.045)	24.746** (11.150)	-304.862 (298.086)	-250.523 (360.504)
Observations	55	55	54	54	54	54	54	54
R-squared	0.564	0.646	0.633	0.677	0.644	0.643	0.753	0.763

Table A21: Effect of climate change on fruit production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Fruits	-0.179* (0.092)	-0.224* (0.122)	-0.166* (0.093)	-0.155 (0.094)	-0.173* (0.094)	-0.172* (0.092)	-0.256* (0.132)	-0.280** (0.104)
LR								
Log_lab_fruits	-0.041 (0.202)	-0.034 (0.172)	-0.208 (0.167)	-0.070 (0.218)	-0.158 (0.230)	-0.159 (0.228)	-0.155 (0.170)	-0.208 (0.131)
Log_Terre_fruits	0.688 (4.020)	-0.147 (3.090)	4.871 (6.851)	4.991 (7.504)	5.132 (6.881)	4.807 (6.520)	3.329 (4.386)	5.866 (3.823)
Log_Fertilisants_fruits	-0.378 (0.402)	-0.270 (0.328)	-0.406 (0.392)	-0.583 (0.563)	-0.372 (0.431)	-0.362 (0.421)	-0.216 (0.307)	-0.121 (0.231)
log_Capital	0.890*** (0.295)	0.840*** (0.253)	0.995*** (0.232)	1.102*** (0.306)	0.837** (0.323)	0.856*** (0.307)	0.791*** (0.231)	1.002*** (0.214)
temp	0.525 (0.793)	-20.767 (55.280)			1.539 (5.698)	0.343 (0.858)	-44.781 (48.051)	-72.667** (33.463)
temp2		0.430 (1.120)					0.913 (0.973)	1.499** (0.673)
pluvio			0.003 (0.003)	-0.057 (0.069)	0.021 (0.086)	0.002 (0.003)	-0.002 (0.012)	-0.040 (0.061)
pluvio2				0.000 (0.000)			0.000 (0.000)	0.000* (0.000)
temp_pluvio					-0.001 (0.003)			-0.001 (0.002)
SR								
LD.Ind_prod_Fruits	-0.093 (0.136)	-0.138 (0.144)	-0.132 (0.137)	-0.091 (0.146)	-0.139 (0.144)	-0.137 (0.141)	-0.179 (0.161)	-0.055 (0.139)
L2D.Ind_prod_Fruits	-0.459*** (0.134)	-0.421*** (0.139)	-0.488*** (0.132)	-0.518*** (0.146)	-0.487*** (0.142)	-0.494*** (0.137)	-0.439*** (0.152)	-0.299*** (0.137)
D.Log_lab_fruits	0.013 (0.087)	0.027 (0.089)	0.026 (0.091)	0.013 (0.096)	-0.008 (0.094)	-0.009 (0.093)	0.016 (0.098)	0.011 (0.080)
LD.Log_lab_fruits	0.096 (0.090)	0.084 (0.093)	0.096 (0.090)	0.110 (0.094)	0.129 (0.094)	0.129 (0.092)	0.119 (0.101)	0.192** (0.083)
D.Log_Terre_fruits	-0.787 (1.490)	-2.386 (1.743)	-1.145 (1.606)	-0.855 (1.654)	-1.085 (1.645)	-1.012 (1.582)	-2.743 (1.967)	-2.258 (1.725)
LD.Log_Terre_fruits	0.949 (1.542)	1.321 (1.748)	1.021 (1.538)	0.869 (1.605)	0.906 (1.631)	0.813 (1.547)	1.091 (1.857)	0.398 (1.614)
L2D.Log_Terre_fruits	-0.074 (1.599)	0.723 (1.771)	-0.524 (1.606)	-0.124 (1.679)	-0.764 (1.696)	-0.716 (1.654)	-0.089 (1.976)	-0.803 (1.558)
D.Log_Fertilisants_fruits	0.134** (0.055)	0.167*** (0.059)	0.109* (0.054)	0.130** (0.060)	0.143** (0.066)	0.145** (0.065)	0.160** (0.073)	0.138** (0.058)
D.log_Capital	0.002 (0.240)	-0.037 (0.247)	0.149 (0.246)	0.158 (0.250)	0.141 (0.268)	0.124 (0.252)	0.078 (0.271)	0.104 (0.235)
D.temp	-0.143 (0.102)	6.272 (11.726)			-0.142 (0.113)	-0.141 (0.111)	8.246 (12.482)	10.040 (9.954)
LD.temp	-0.081 (0.078)	-4.742 (9.721)			-0.085 (0.083)	-0.083 (0.081)	-1.507 (10.484)	-0.605 (8.215)
L2D.temp	-0.080 (0.056)	-4.554 (6.995)			-0.101 (0.061)	-0.102 (0.060)	-2.173 (7.470)	1.371 (5.951)
D.temp2		-0.130 (0.238)					-0.170 (0.253)	-0.204 (0.202)
LD.temp2		0.094 (0.197)					0.029 (0.213)	0.011 (0.166)
L2D.temp2		0.091 (0.142)					0.042 (0.152)	-0.028 (0.121)
D.pluvio			-0.001 (0.000)	0.007 (0.008)	-0.001 (0.000)	-0.001 (0.000)	-0.001 (0.001)	0.015** (0.007)
LD.pluvio			-0.001 (0.000)	0.003 (0.006)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.000)	0.009 (0.006)
L2D.pluvio			-0.000* (0.000)	0.004 (0.005)	-0.000* (0.000)	-0.000* (0.000)	-0.001* (0.000)	0.012** (0.005)
L3D.pluvio			-0.000 (0.000)	0.003 (0.003)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.010*** (0.003)
D.pluvio2				-0.000 (0.000)				-0.000** (0.000)
LD.pluvio2				-0.000 (0.000)				-0.000 (0.000)
L2D.pluvio2				-0.000 (0.000)				-0.000** (0.000)
L3D.pluvio2				-0.000 (0.000)				-0.000*** (0.000)
Constant	-2.834 (4.812)	56.290 (171.421)	-4.169 (4.083)	3.026 (8.042)	-10.927 (25.826)	-5.520 (5.062)	137.257 (191.125)	252.829 (155.496)
Observations	55	55	54	54	54	54	54	54
R-squared	0.521	0.575	0.539	0.599	0.607	0.606	0.651	0.830

Table A22: Effect of climate change on other productions

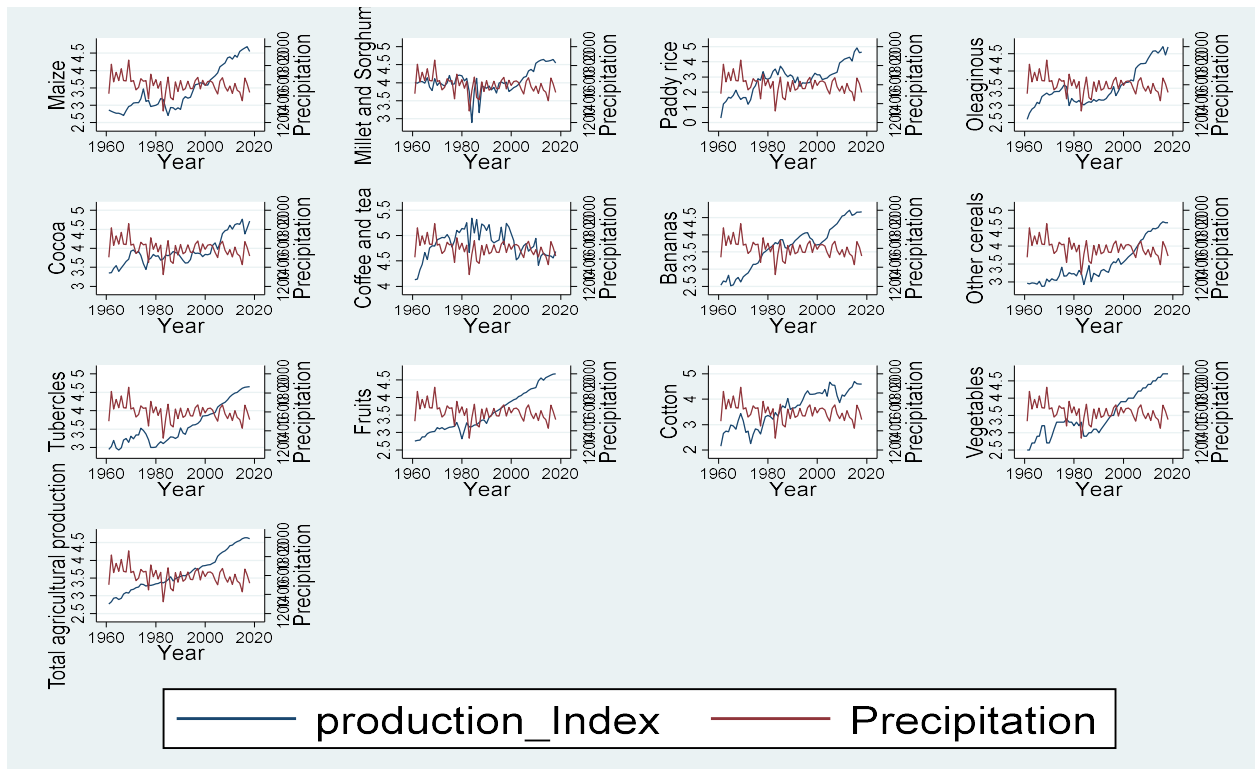
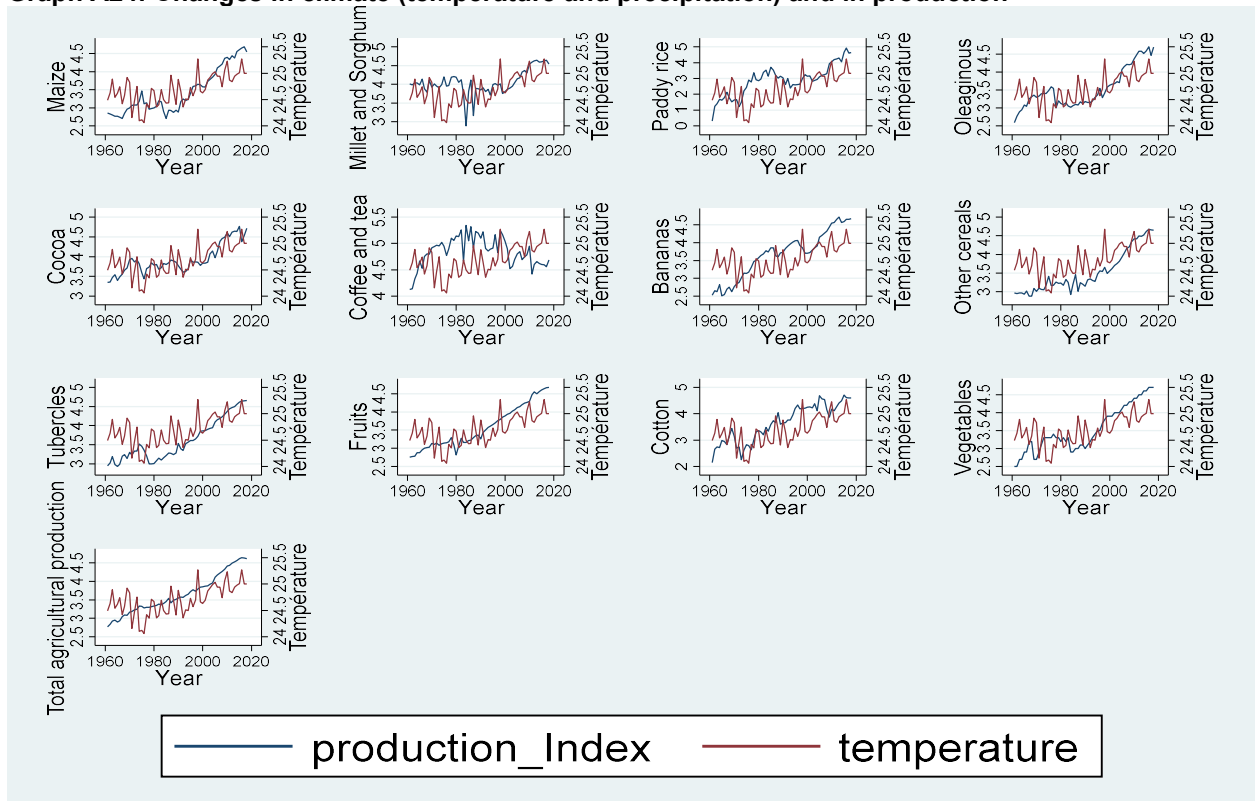
	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod__total	-0.145** (0.057)	-0.165** (0.079)	-0.141** (0.056)	-0.102* (0.054)	-0.143** (0.060)	-0.143** (0.059)	-0.178** (0.079)	-0.090 (0.084)
LR								
Log_lab_tot	0.056 (0.141)	0.030 (0.132)	0.053 (0.152)	0.219 (0.281)	0.052 (0.178)	0.056 (0.175)	-0.029 (0.135)	0.312 (0.549)
Log_Terre_tot	-4.231 (2.684)	-3.724 (2.746)	-5.881 (3.859)	-8.819 (6.135)	-5.970 (4.043)	-5.750 (3.822)	-4.052 (3.288)	-10.147 (11.244)
Log_Fertilisants_tot	0.162 (0.172)	0.152 (0.163)	0.158 (0.162)	0.211 (0.262)	0.148 (0.186)	0.139 (0.179)	0.172 (0.157)	0.195 (0.362)
log_Capital	0.706*** (0.211)	0.674*** (0.206)	0.854*** (0.158)	0.899*** (0.224)	0.831*** (0.249)	0.812*** (0.229)	0.731*** (0.195)	0.545 (0.432)
temp	0.251 (0.469)	-26.542 (39.112)			-0.727 (3.747)	0.139 (0.487)	-41.053 (33.304)	-15.526 (79.608)
temp2		0.543 (0.794)					0.834 (0.677)	0.331 (1.583)
pluvio			-0.001 (0.002)	0.035 (0.047)	-0.014 (0.056)	-0.001 (0.002)	0.011 (0.010)	0.088 (0.158)
pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					0.001 (0.002)			0.000 (0.004)
SR								
D.Log_lab_tot	0.044 (0.051)	0.042 (0.052)	0.065 (0.060)	0.153** (0.063)	0.058 (0.063)	0.057 (0.062)	0.067 (0.063)	0.141** (0.066)
D.Log_Terre_tot	1.684** (0.827)	1.094 (0.973)	1.163 (0.851)	0.706 (0.820)	1.332 (0.905)	1.316 (0.890)	0.146 (1.053)	0.191 (1.051)
D.Log_Fertilisants_tot	-0.039 (0.033)	-0.037 (0.036)	-0.054* (0.029)	-0.040 (0.031)	-0.059 (0.037)	-0.057 (0.036)	-0.064* (0.036)	-0.033 (0.042)
D.log_Capital	-0.189 (0.133)	-0.233 (0.142)	-0.201 (0.130)	-0.172 (0.123)	-0.234 (0.149)	-0.224 (0.141)	-0.301** (0.145)	-0.217 (0.160)
D.temp	-0.062 (0.058)	2.228 (6.003)			-0.041 (0.062)	-0.043 (0.060)	2.923 (5.824)	-0.397 (5.773)
LD.temp	-0.004 (0.044)	1.083 (4.552)			0.014 (0.048)	0.012 (0.046)	1.317 (4.403)	0.490 (4.299)
L2D.temp	-0.017 (0.032)	4.148 (3.481)			-0.013 (0.033)	-0.014 (0.032)	4.556 (3.480)	2.670 (3.517)
D.temp2		-0.047 (0.122)					-0.060 (0.118)	0.007 (0.117)
LD.temp2		-0.022 (0.093)					-0.026 (0.089)	-0.010 (0.087)
L2D.temp2		-0.085 (0.071)					-0.093 (0.071)	-0.055 (0.071)
D.pluvio			-0.000 (0.000)	-0.001 (0.004)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.005 (0.005)
LD.pluvio			-0.000 (0.000)	-0.002 (0.003)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.004 (0.004)
L2D.pluvio			-0.000 (0.000)	-0.002 (0.002)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.004 (0.003)
L3D.pluvio			-0.000 (0.000)	-0.003** (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.005** (0.002)
D.pluvio2				0.000 (0.000)				0.000 (0.000)
LD.pluvio2				0.000 (0.000)				0.000 (0.000)
L2D.pluvio2				0.000 (0.000)				0.000 (0.000)
L3D.pluvio2				0.000** (0.000)				0.000** (0.000)
Constant	5.492 (4.533)	59.982 (93.652)	8.901 (5.501)	6.698 (5.669)	11.861 (15.592)	8.483 (5.908)	95.973 (92.559)	19.862 (101.479)
Observations	55	55	54	54	54	54	54	54
R-squared	0.350	0.390	0.397	0.537	0.457	0.456	0.555	0.661

p < 0.10, ** p < 0.05, *** p < 0.01

Table A23: Effect of climate change on cotton production

	(1)	(2)	(3)	(4)	(5)	(6)	a7	a8
ADJ								
L.Ind_prod_Coton_graine	-0.434*** (0.138)	-0.462*** (0.150)	-0.483*** (0.151)	-0.393** (0.154)	-0.454** (0.171)	-0.475*** (0.161)	-0.395** (0.180)	-0.226 (0.184)
LR								
Log_lab_coton	-0.278 (0.251)	-0.207 (0.238)	-0.271* (0.147)	-0.575** (0.279)	-0.352 (0.264)	-0.343 (0.247)	-0.408 (0.343)	-0.425 (0.563)
Log_Terre_Coton	4.978 (4.076)	3.322 (4.145)	7.929* (4.578)	7.163 (5.243)	8.358 (5.590)	7.557 (4.843)	2.705 (6.622)	11.934 (14.618)
Log_Fertilisants_Coton	0.270 (0.339)	0.279 (0.320)	0.244 (0.233)	0.707* (0.392)	0.323 (0.343)	0.343 (0.320)	0.593 (0.457)	0.052 (0.812)
log_Capital	0.466 (0.358)	0.542 (0.356)	0.303 (0.197)	0.094 (0.270)	0.383 (0.349)	0.413 (0.322)	-0.024 (0.496)	-0.672 (1.212)
temp	-0.181 (0.917)	76.392 (66.452)			2.050 (6.546)	-0.368 (0.879)	84.511 (79.344)	132.091 (144.363)
temp2		-1.553 (1.351)					-1.697 (1.606)	-1.935 (2.647)
pluvio			0.002 (0.003)	0.131 (0.086)	0.040 (0.100)	0.002 (0.003)	0.169 (0.113)	0.756 (0.752)
pluvio2				-0.000 (0.000)			-0.000 (0.000)	-0.000 (0.000)
temp_pluvio					-0.001 (0.004)			-0.022 (0.024)
SR								
D.Log_lab_coton	-0.147 (0.255)	-0.166 (0.257)	-0.265 (0.251)	-0.337 (0.240)	-0.263 (0.271)	-0.261 (0.268)	-0.396 (0.266)	-0.361 (0.247)
LD.Log_lab_coton	0.473* (0.258)	0.431 (0.261)	0.576** (0.242)	0.680*** (0.234)	0.601** (0.265)	0.592** (0.260)	0.608** (0.269)	0.645** (0.250)
D.Log_Terre_Coton	-6.805 (4.465)	-6.594 (5.043)	-4.485 (4.364)	-4.247 (4.075)	-4.807 (4.677)	-4.675 (4.602)	-4.376 (4.977)	-6.875 (4.757)
LD.Log_Terre_Coton	-2.963 (4.570)	-0.328 (4.917)	-5.102 (4.436)	-5.484 (4.296)	-4.453 (4.973)	-5.078 (4.646)	-2.178 (5.050)	3.736 (5.417)
L2D.Log_Terre_Coton	-2.830 (4.529)	-2.674 (4.926)	-4.849 (4.462)	-5.555 (4.228)	-5.515 (4.865)	-5.376 (4.787)	-4.175 (5.033)	-3.866 (4.671)
D.Log_Fertilisants_Coton	0.271* (0.158)	0.349** (0.166)	0.296* (0.152)	0.179 (0.154)	0.278 (0.189)	0.279 (0.186)	0.297 (0.191)	0.288 (0.178)
D.log_Capital	-0.242 (0.643)	-0.394 (0.652)	-0.199 (0.612)	-0.160 (0.571)	-0.276 (0.720)	-0.380 (0.659)	-0.442 (0.646)	0.446 (0.725)
D.temp	0.179 (0.304)	-20.097 (27.178)			0.209 (0.322)	0.211 (0.318)	-16.428 (25.573)	-3.079 (24.503)
LD.temp	0.134 (0.226)	-31.633 (23.731)			0.151 (0.234)	0.160 (0.229)	-19.847 (22.860)	-14.671 (21.339)
L2D.temp	0.053 (0.159)	-4.409 (19.016)			-0.009 (0.172)	-0.007 (0.169)	-4.459 (18.441)	1.072 (17.294)
D.temp2		0.411 (0.552)					0.331 (0.519)	0.060 (0.497)
LD.temp2		0.644 (0.482)					0.403 (0.464)	0.297 (0.433)
L2D.temp2		0.090 (0.386)					0.088 (0.374)	-0.023 (0.351)
D.pluvio			-0.001 (0.001)	-0.051** (0.020)	-0.001 (0.001)	-0.001 (0.001)	-0.061** (0.024)	-0.052** (0.022)
LD.pluvio			0.000 (0.001)	-0.040** (0.016)	-0.000 (0.001)	-0.000 (0.001)	-0.046** (0.019)	-0.039** (0.018)
L2D.pluvio			-0.000 (0.001)	-0.020* (0.012)	-0.000 (0.001)	-0.000 (0.001)	-0.029* (0.015)	-0.022 (0.014)
L3D.pluvio			0.000 (0.000)	-0.013* (0.007)	0.000 (0.000)	0.000 (0.000)	-0.020** (0.009)	-0.024** (0.009)
D.pluvio2				0.000** (0.000)			0.000** (0.000)	0.000** (0.000)
LD.pluvio2				0.000** (0.000)			0.000** (0.000)	0.000** (0.000)
L2D.pluvio2				0.000* (0.000)			0.000* (0.000)	0.000 (0.000)
L3D.pluvio2				0.000* (0.000)			0.000** (0.000)	0.000** (0.000)
Constant	-15.557 (18.168)	-446.704 (393.426)	-31.797 (20.073)	-63.365** (24.563)	-55.306 (77.186)	-26.440 (22.457)	-475.623 (392.582)	-528.688 (364.988)
Observations	55	55	54	54	54	54	54	54
R-squared	0.417	0.477	0.509	0.638	0.536	0.534	0.699	0.752

Graph A24: Changes in climate (temperature and precipitation) and in production



Source: The authors.

