Economic impact of climate change on women's labor market participation in Burkina Faso: a computable general equilibrium analysis

Djibril Ouédraogo[1,2*], Achille Augustin Diendéré[1,2] and Patrice Rélouendé Zidouemba[2,3]

[1]Thomas Sankara University, Saaba, Burkina Faso, [2]Center for Economic and Social Studies, Documentation and Research (CEDRES) and [3]Nazi Boni University, Bobo-Dioulasso, Burkina Faso
*Corresponding author. E-mail: djibrildanielouedraogo@gmail.com

ONLINE APPENDIX

Table A1. Descriptive statistics

Variables	Observations	Mean	Standard deviation	Min	Max
Unskilled women urban	370	5.152	2.369	1	7
Unskilled women rural	854	6.131	2.792	1	11
Unskilled men urban	353	1.024	0.769	1	3
Unskilled men rural	711	2.126	1.186	1	4
Skilled women urban	19	2.039	1.057	1	4
Skilled women rural	35	4.461	1.264	1	6
Skilled men urban	14	1.254	1.453	1	2
Skilled men rural	30	1.333	0.83	1	2
Women rural	889	6.31	2.115	1	8.5
Women urban	389	6	1.1	1	5.5
Men rural	741	2.07	3.823	1	3
Men urban	367	1.07	0.95	1	2.5
Women	1278	6.15	0.516	1	7
Men	1108	1.57	1.042	1	5.5

Table A2. Percentage difference in Burkina Faso rainfed crop yields

Differences are calculated over a no climate change reference scenario for 2030 and 2050, under different representative carbon concentration scenarios (RCPs), with business-as-usual demographic and economic growth trajectories (SSP2).

	2018	RCP4.5_SSP2		RCP6.0_SSP2		RCP8.5_SSP2	
Crops	Baseline Value (TM/ha)	2030	2050	2030	2050	2030	2050
CER-Maize	1.9391	-9.42	-18.12	-8.53	-16.34	-11.50	-21.69
CER-Millet	1.0411	-0.47	-0.97	-1.97	-3.88	-2.56	-5.03
CER-Other Cereals	1.0409	-0.98	-1.53	-1.08	-1.63	-1.88	-3.08
CER-Rice	1.5953	-1.87	-3.77	-1.41	-2.87	-0.97	-1.99
CER-Sorghum	1.2922	-3.77	-7.46	-3.70	-7.28	-4.75	-9.32
COT-Cotton	0.4965	-2.04	-3.87	-3.66	-6.78	-3.64	-6.50
COT-Other	1.1522	-0.18	-0.29	-1.05	-1.87	-0.78	-1.17
F&V-Temperate Fruit	6.7094	-5.66	-10.99	-4.93	-9.63	-5.66	-10.85
F&V-Tropical Fruit	6.9021	-1.25	-2.18	-3.37	-6.08	-3.57	-6.13
F&V-Vegetables	9.9878	-5.02	-9.73	-4.23	-8.24	-4.64	-8.87
OLS-Groundnut	0.8500	-1.70	-3.01	-4.10	-7.34	-4.47	-7.62
OLS-Other Oilseeds	1.3220	-1.70	-3.04	-3.73	-6.80	-4.07	-6.99
OLS-Soybean	1.2798	-3.65	-6.97	-4.97	-9.16	-5.46	-9.64
PUL-Cowpeas	0.5919	0.16	0.41	-0.79	-1.31	-0.46	-0.57
PUL-Other Pulses	0.8835	-1.75	-3.40	-2.71	-5.11	-2.61	-4.59
R&T-Cassava	4.3989	-2.28	-4.53	-1.95	3.89	-2.00	-3.92
R&T-Potato	5.5495	0.28	-0.58	-1.91	-4.70	-0.12	-1.82
R &T-Sweet Potato	11.7151	-0.56	-0.75	-0.91	-1.41	-0.52	-0.33
R&T-Yams	10.1577	0.17	0.46	-0.45	-0.64	0.12	0.64
SGC-Sugarcane	104.8499	-4.83	-9.53	-4.34	-8.55	-6.04	-11.79

CER = cereals; COT = cotton; F&V = fruits and vegetables; OLS = oilseeds; PUL = pulses; R&T = roots and tubers; SGC = Sugarcane

Table A3. Percentage difference in Burkina Faso rainfed crop area

Percentage difference is calculated over a no-climate change reference scenario for 2030 and 2050, under low, medium and high carbon emission scenarios (different representative carbon concentration scenarios [RCPs]), with business-as-usual demographic and economic growth trajectories (SSP2).

	Percentage Change in Area Harvested from No Climate Change Scenario					
Crops	**RCP4.5_SSP2**		**RCP6.0_SSP2**		**RCP8.5_SSP2**	
	2030	**2050**	**2030**	**2050**	**2030**	**2050**
CER-Maize	-0.43	-1.48	-0.34	-1.15	0.35	-0.25
CER-Millet	0.83	1.43	0.45	0.68	1.13	2.06
CER-Other Cereals	-3.27	-6.19	-3.07	-5.86	-3.59	-6.58
CER-Rice	1.19	2.41	1.54	2.97	2.16	4.40
CER-Sorghum	-0.55	-1.22	-0.46	-0.95	-0.28	-0.62
COT-Cotton	-0.07	-0.05	-0.67	-1.24	-0.67	-1.19
COT-Other	0.04	-0.12	-0.04	-0.23	-0.18	-0.54
F&V-Temperate Fruit	-2.10	-4.09	-1.75	-3.48	-2.09	-4.12
F&V-Tropical Fruit	0.51	1.10	-0.12	-0.22	-0.27	-0.40
F&V-Vegetables	-2.86	-5.29	-2.09	-3.89	-2.66	-4.85
OLS-Groundnuts	2.51	5.02	1.65	3.23	1.72	3.37
OLS-Other Oilseeds	1.31	1.96	1.87	2.51	1.79	1.86
OLS-Soybeans	-0.08	-0.21	-0.32	-0.64	-0.46	-0.94
PUL-Cowpeas	1.10	2.22	0.95	1.90	0.86	1.76
PUL-Other Pulses	-5.08	-10.04	-5.24	-10.40	-6.22	-11.81
R&T-Cassava	0.39	0.91	0.25	0.56	-0.06	0.09
R&T-Potato	3.28	4.50	1.71	1.19	4.47	5.27
R&T-Sweet Potato	-0.15	0.09	0.03	0.32	-0.17	0.12
R&T-Yams	0.61	1.35	0.52	1.12	0.51	1.18
SGC-Sugarcane	2.39	3.99	2.16	3.60	3.00	4.69

CER = cereals; COT = cotton; F&V = fruits and vegetables; OLS = oilseeds; PUL = pulses; R&T = roots and tubers; SGC = Sugarcane

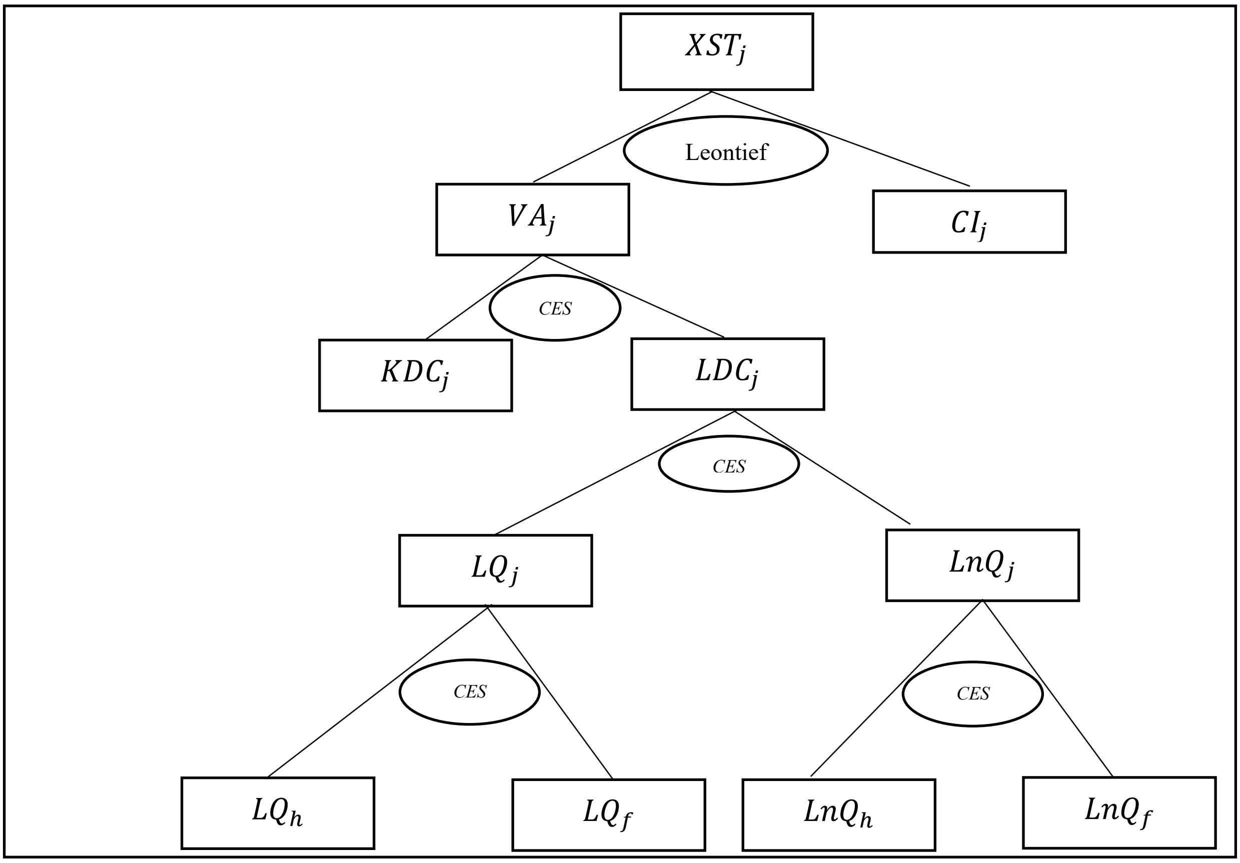

Figure A1. Nested structure of agricultural production.

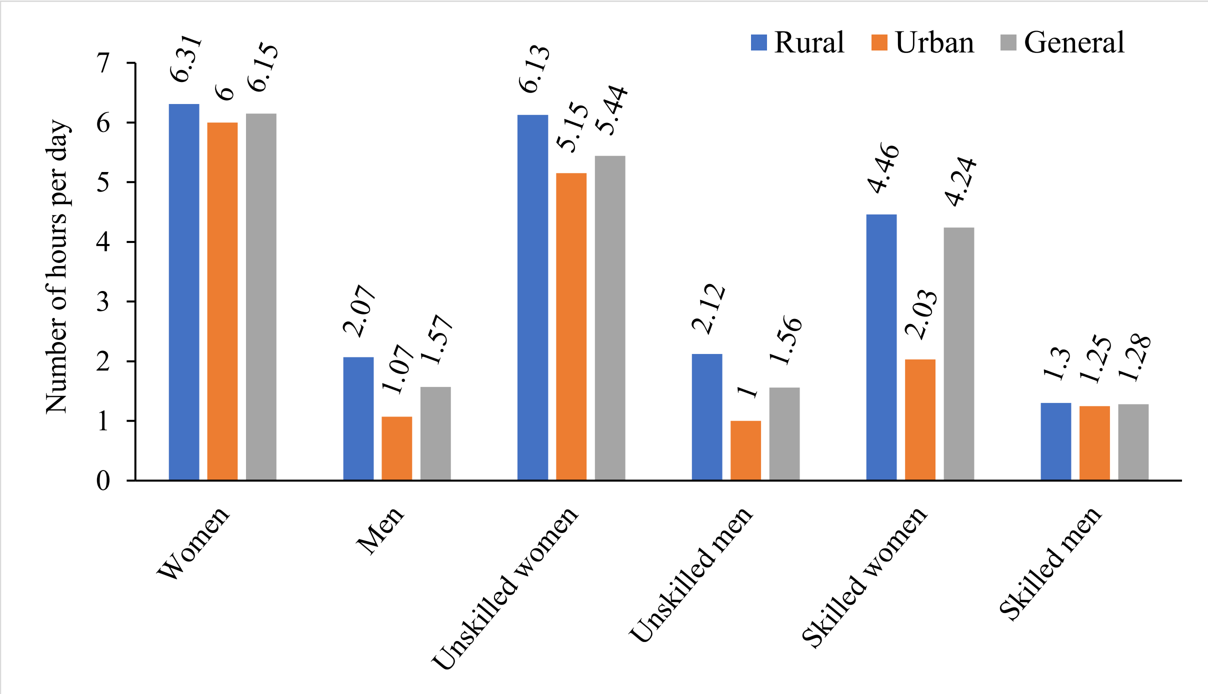

Figure A2. Distribution of time spent on domestic activities by gender.
Source: Authors, based on OECD survey data (2018).

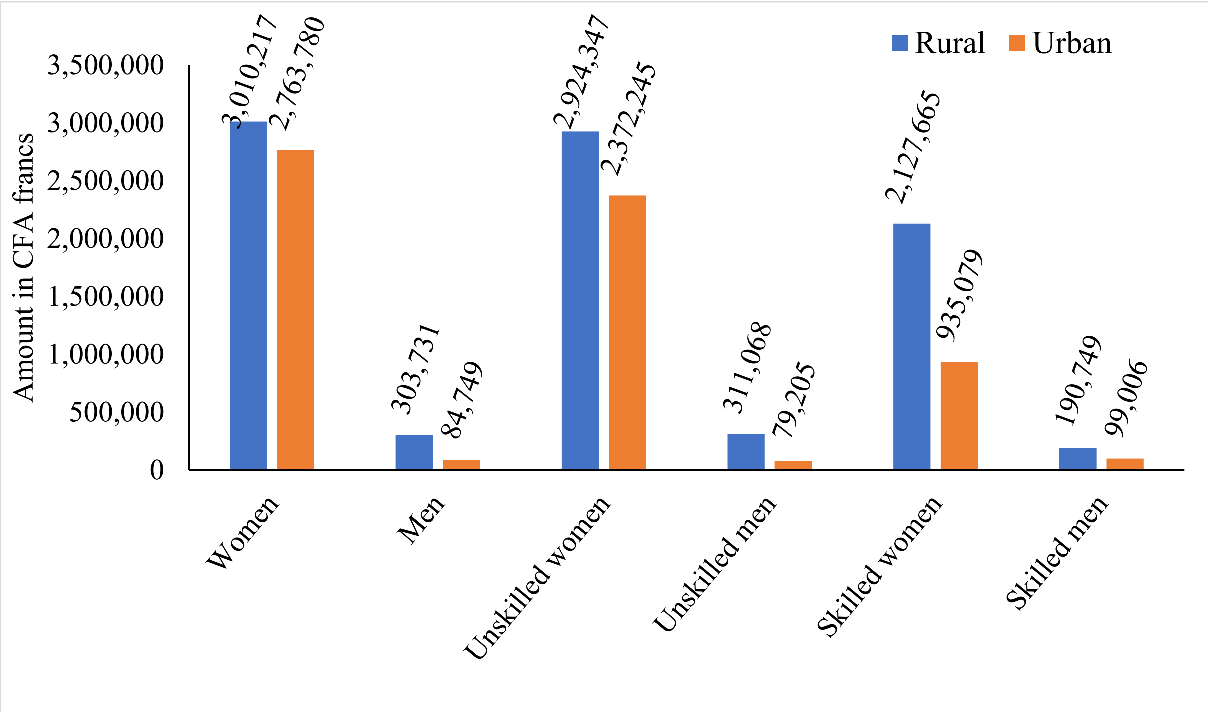

Figure A3. Monetary values in FCFA of time spent on domestic activities.
Source: Authors, based on OECD survey data (2018).

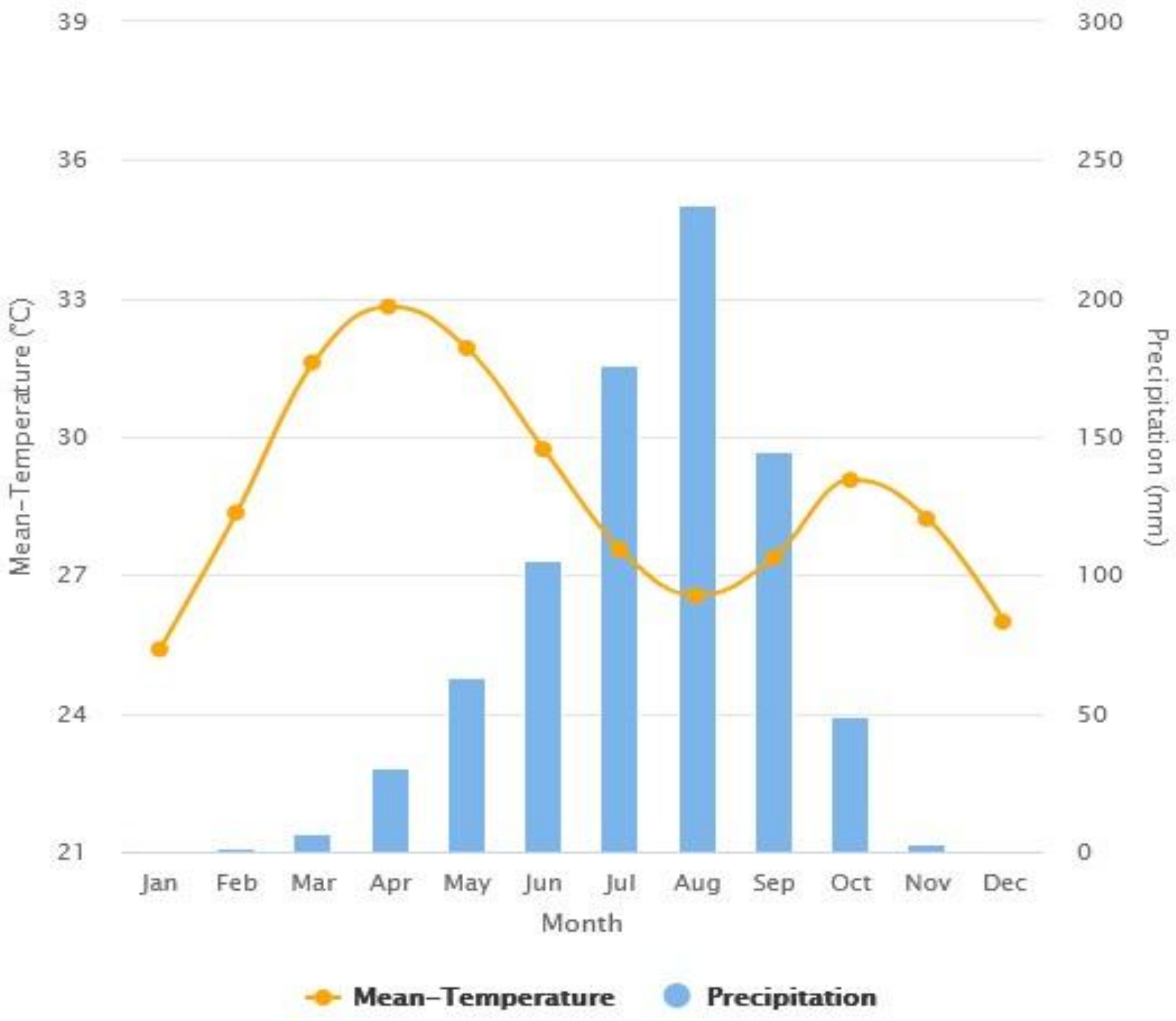

Figure A4. Monthly evolution of precipitation and average temperatures in Burkina Faso from 1991 to 2020.
Source: World Bank (https://climateknowledgep-ortal.worldbank.org/country/burkina-faso).

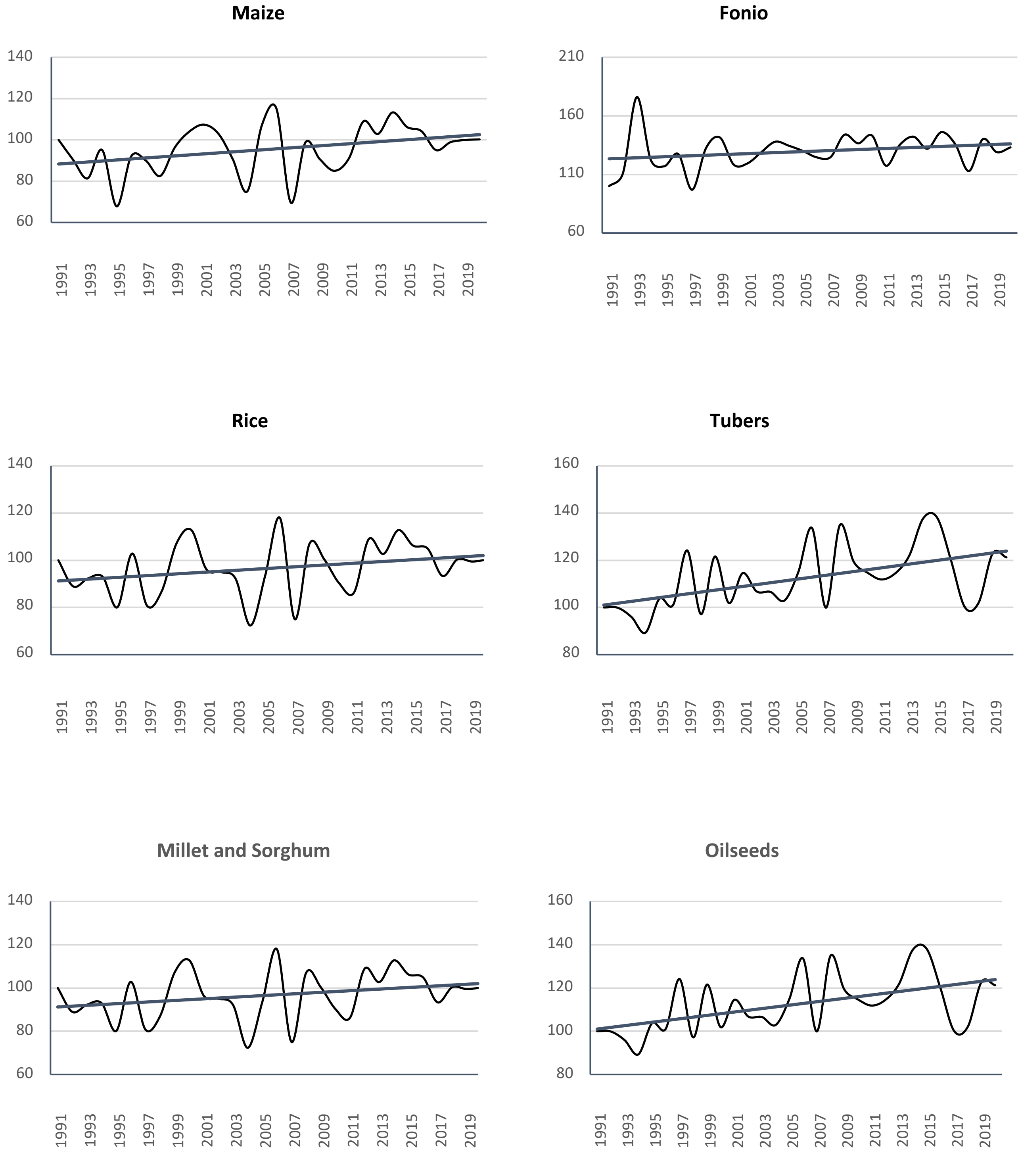

Figure A5. Evolution of yields of the main crops in Burkina Faso since 1991.

The derivation for composite labor demand and composite capital demand mentioned in the equation:

Let us assume that the value added (VA_j) of sector j is produced using composite labor (LDC_j) and composite capital (KDC_j) according to a CES-type function:

$$VA_j = B_j^{VA}\left[\alpha_j^{VA} LDC_j^{-\sigma_j^{VA}} + \left(1-\alpha_j^{VA}\right) KDC_j^{-\sigma_j^{VA}}\right]^{-\frac{1}{\sigma_j^{VA}}} . \tag{A1}$$

Optimization conditions:

The producer seeks to minimize the total cost of production for a given level of (VA_j). The first-order condition for optimization is that the TMST between composite capital and composite labor must be equal to the ratio of their prices:

$$TMST_{L,K} = \frac{-dkdc_j}{dLdc_j} = \frac{PML}{\mathrm{PMK}} , \tag{A2}$$

$$\frac{PML}{\mathrm{PMK}} = \frac{\frac{\partial VA_j}{\partial Ldc_j}}{\frac{\partial VA_j}{\partial Ldc_j}} = \frac{\left(1-\alpha_j^{VA}\right)}{\alpha_j^{VA}}\left(\frac{KDC_j}{LDC_j}\right)^{1+\sigma_j^{VA}} . \tag{A3}$$

By equating the TMST with the ratio of factor prices, we have

$$\frac{\left(1-\alpha_j^{VA}\right)}{\alpha_j^{VA}}\left(\frac{KDC_j}{LDC_j}\right)^{1+\sigma_j^{VA}} = \frac{WC_j}{RC_j} , \tag{A4}$$

$$\left(\frac{KDC_j}{LDC_j}\right)^{1+\sigma_j^{VA}} = \frac{\alpha_j^{VA}}{\left(1-\alpha_j^{VA}\right)} \frac{RC_j}{WC_j} , \tag{A5}$$

$$\frac{KDC_j}{LDC_j} = \left[\frac{\alpha_j^{VA}}{\left(1-\alpha_j^{VA}\right)} \frac{RC_j}{WC_j}\right]^{\frac{1}{1+\sigma_j^{VA}}} , \tag{A6}$$

$$LDC_j = \left[\frac{\alpha_j^{VA}}{\left(1-\alpha_j^{VA}\right)} \frac{RC_j}{WC_j}\right]^{\frac{1}{1+\sigma_j^{VA}}} . KDC_j . \tag{A7}$$

So $\frac{1}{1+\sigma_j^{VA}} = \sigma_j^{VA}$. By replacing $\frac{1}{1+\sigma_j^{VA}}$ by σ_j^{VA}, we have:

$$LDC_j = \left[\frac{\alpha_j^{VA}}{\left(1-\alpha_j^{VA}\right)} \frac{RC_j}{WC_j}\right]^{\sigma_j^{VA}} . \; KDC_j . \qquad \text{(A8)}$$