COUNTRY DOSSIER

Republic of the Congo

Water, climate, fertilisers and crops: National study and a study of each region, potential benefits of our products, external trade

Green Solutions · contact@green-solutions-group.com · green-solutions-group.com



The vegetable-growing area of Brazzaville, on the Congo River.

Foreword

This dossier describes Republic of the Congo from the angle of water, climate, fertilisers and crops. It is written for the ministries in charge of agriculture, water and trade, the regional directorates of agriculture, cooperatives and producer organisations. It answers three questions: Where is water in short supply, for which crops, and in which regions? It then examines what difference our products can make, in rainfed as well as irrigated farming, and what that can mean for the country's external trade.

Reading the sources. Every figure refers to a source, named in the text and detailed in Annex A. Each source carries a confidence level:

How to read this document

- **A**: Official statistics or international database (World Bank, FAO, Congolese public bodies (Ministry of Agriculture, National Institute of Statistics)).
- **B**: Research institute, laboratory, United Nations agency or recognised climate model.
- **C**: Manufacturer statement, website, press or estimate.
- "M" means million; "Mm³" means million cubic metres; "t" means tonnes; "I$" means constant 2014-2016 international dollars.
- A "scenario" is a calculation based on the trials cited. It is not a measurement made in Republic of the Congo.

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Summary

The points below summarise the dossier. The figures come from public sources: The World Bank, FAO (FAOSTAT, AQUASTAT), Congolese public bodies (Ministry of Agriculture, National Institute of Statistics), PVGIS and NASA POWER. The production gains and water savings are scenarios, described in Annex B.

6.48 M
Inhabitants in 2025 (World Bank)

162,292 ha
Of cassava, fresh harvested in 2024, the main crop

2,000 ha
Equipped for irrigation (2024)

+855 t
Of maize per 10,000 ha treated, central scenario

0.3 Mm³
Of irrigation water saved a year, central scenario

117 M$
Of agricultural exports in 2024 (FAOSTAT)

Key points

• **Predominantly rainfed farming.** 2,000 ha equipped for irrigation in 2024, for 0.65 million hectares of cropland: Almost every harvest depends on rain.

• **Cassava, fresh: The main crop.** 162,292 ha harvested in 2024, for 1.71 million tonnes, or 10.54 t/ha.

• **Water is not scarce over the year as a whole; it is scarce between rainfall events.** National water stress is below 0.1%, but at Pointe-Noire, atmospheric water demand exceeds rainfall by 178 mm.

• **In rainfed farming, the gain is counted in tonnes.** In the central scenario, 855 t of maize and 13,539 t of potato more per 10,000 ha treated.

• **In irrigated farming, the water saved could allow irrigation schemes to be expanded.** 0.3 Mm³ a year in the central scenario, enough to irrigate about 324 more ha, or 16.2% of the equipped area.

• **An organic supply chain.** 5,710 ha of certified organic cropland in 2023: ECOFERT® is EU Bio certified.

• **All nitrogen is imported.** 3,414 t of nitrogen used in 2024, 3,414 t imported, no national production.

• **Farm trade.** $117 million of exports and $1,044 million of imports in 2024. Leading export: Cocoa beans ($80 million). Rice weighs $70 million of purchases.

Key figures

Key indicators for Republic of the Congo

Indicator	Value	Year	Source (level)
Population	6.48 M	2025	World Bank (A1)
GDP per capita	2,515 $	2025	World Bank (A1)
Agriculture's share of GDP	10.1%	2025	World Bank (A1)
Agricultural employment	36.4%	2025	World Bank (A1)
Cropland	652,510 ha	2024	FAOSTAT (A6)
Area equipped for irrigation	2,000 ha	2024	FAOSTAT (A6)
Harvested area: Cassava, fresh	162,292 ha	2024	FAOSTAT (A2)
Certified organic cropland	5,710 ha	2023	FAOSTAT (A6)
Agricultural exports	117 M$	2024	FAOSTAT (A4)

Indicator	Value	Year	Source (level)
Agricultural imports	1,044 M$	2024	FAOSTAT (A4)
Mineral nitrogen, agricultural use	3,414 t	2024	FAOSTAT (A5)

Source: Table based on the sources indicated.

1. Green Solutions and our products

Green Solutions develops products for water, fertilisation and crop protection. Four families are of interest to this dossier. The yields cited are those published by the manufacturer or by the trials, with their confidence level.

Products covered by this dossier

Product	Claimed use	Published evidence (level)
EVERGREEN® (water-retention polymer)	Holds rain or irrigation water as a gel, near the roots.	Trials on maize, potato, watermelon, date palm and soybean. Level B to C.
ECOSORB® (water-retention polymer based on corn starch)	Same use; action lasting 2 to 3 years according to the website.	Soybean trial (China); laboratory acrylamide analysis. Level B to C.
ECOFERT® (fertiliser)	Fertiliser certified by SOHISCERT and EU Bio, usable in organic farming.	Published certificate; potato trial combined with EVERGREEN®. Level A (certificate), C (results).
Paulownia ALTIFOLIA®	Fast-growing tree for agroforestry.	Website figures; no trial in Republic of the Congo. Level C.
Water Vital®, NAPEMA®	Outside the scope of this dossier.	No independent source in the documents consulted.

Source: Green Solutions website (product sheets and published trials), Annex A.

The indicative dose published on the website is 30 to 75 kg/ha.



Vegetables planted on the Congo River, in Brazzaville.

2. Republic of the Congo in figures

Republic of the Congo had 6.48 million inhabitants in 2025, 36% of them in rural areas. Agriculture accounts for 10.1% of gross domestic product and employs 36% of the labour force. The country covers 341.5 thousand km², of which 31% is agricultural land. Undernourishment affects 25.0% of the population.

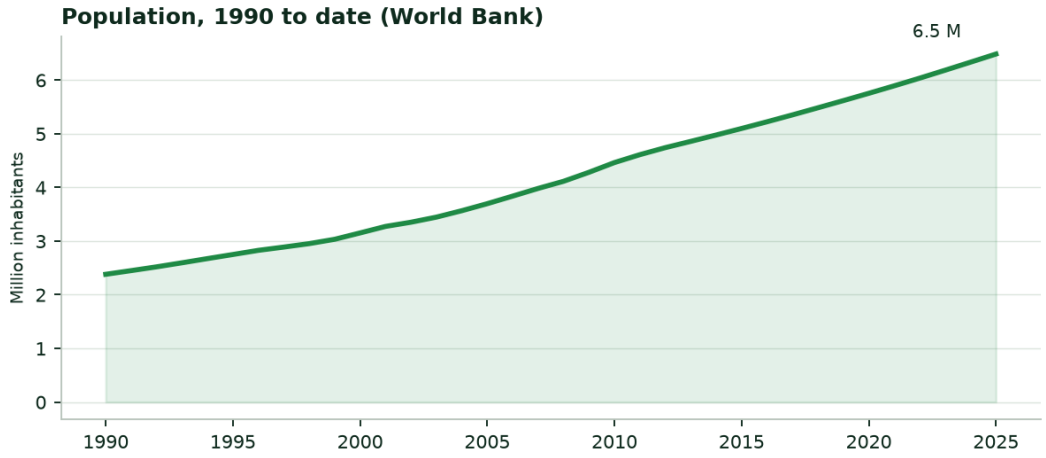


Figure 1. Population of Republic of the Congo, 1990 to date. Source: World Bank (A1)

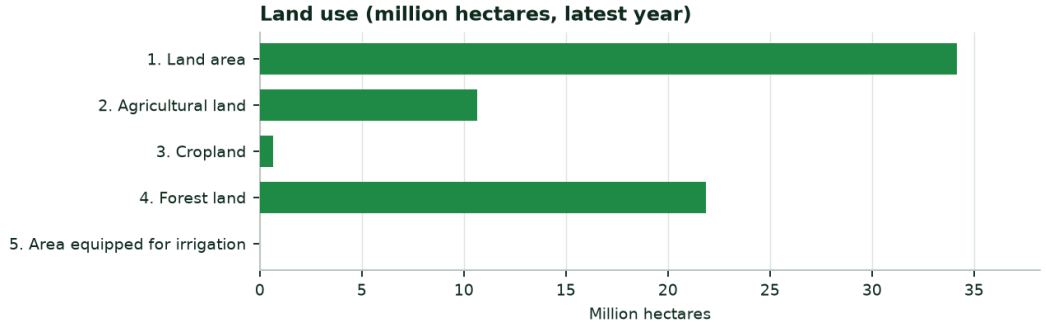


Figure 2. Land use, latest year published. Source: FAOSTAT (A6)

Agricultural and water indicators, latest year published

Indicator	Value	Year	Source
Cropland certified organic	5,710 ha	2023	FAOSTAT (A6)
Average cereal yield	874 kg/ha	2024	World Bank (A1)
Fertiliser use per hectare of arable land	19.1 kg/ha	2024	World Bank (A1)
Water withdrawals, agricultural share	4.4%	2022	World Bank (A1)
Internal freshwater resources	222.0 km³	2022	World Bank (A1)
Internal resources per inhabitant	36,785 m³	2022	World Bank (A1)



Vegetable gardens in Brazzaville.

3. Sunshine, rainfall and climate change

3.1 Sunshine

Global solar radiation reaches 1,598 to 1,941 kWh/m² a year depending on the region. Energy is not the limit: Water available at the right time makes the harvest.

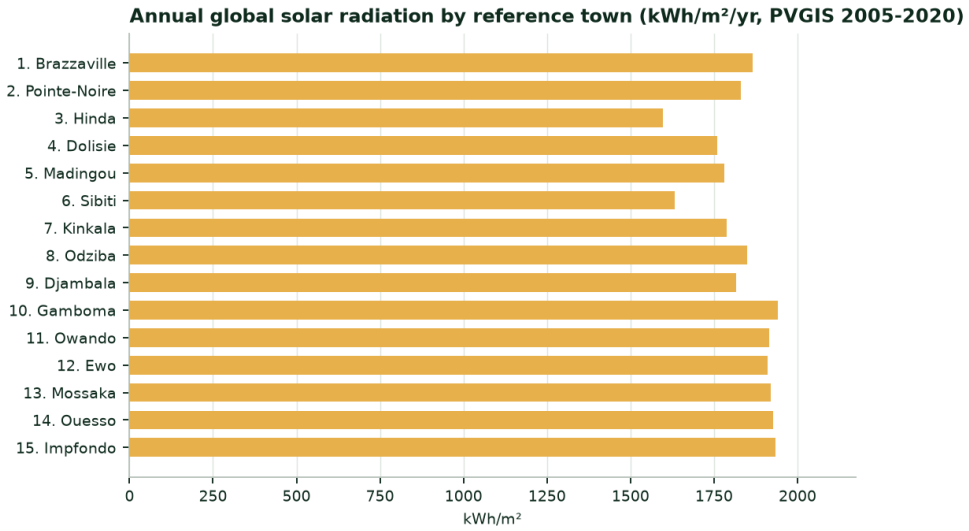


Figure 3. Annual global solar radiation in each reference town. Source: PVGIS (A8)

3.2 Rainfall and evapotranspiration

It rains 1,756 mm a year at Sibiti, but only 1,022 mm at Pointe-Noire, where reference evapotranspiration reaches 1,200 mm. In the south (Pointe-Noire, Niari, Bouenza, Pool, Brazzaville), the dry season runs from June to September, with almost no rain in July and August. Further north it shortens; in Ouesso and Impfondo, near the equator, it rains all year, with drier months from December to February.

Mean monthly rainfall, 1991-2020 (mm per month)

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Brazzaville	157	149	205	204	150	13	4	14	56	163	276	229
Pointe-Noire	130	140	153	132	67	1	1	2	9	79	178	130
Hinda	163	161	196	200	121	6	2	4	22	133	259	203
Dolisie	169	164	198	201	127	8	2	4	27	148	276	219
Madingou	168	151	205	207	140	12	3	7	39	154	282	228
Sibiti	185	167	224	219	154	13	4	9	45	177	313	246
Kinkala	157	149	205	204	150	13	4	14	56	163	276	229
Odziba	165	159	214	208	150	16	8	30	82	185	276	220
Djambala	125	127	178	169	132	32	16	36	99	192	232	173
Gamboma	123	136	173	165	144	59	28	57	145	217	221	180
Owando	99	129	167	160	151	86	47	80	170	231	201	156
Ewo	104	124	160	156	136	56	27	50	130	210	205	150
Mossaka	105	124	159	159	138	75	44	68	158	202	190	154
Ouesso	48	80	144	145	148	125	105	142	211	215	164	87
Impfondo	48	76	145	142	136	135	156	146	198	182	149	67

Source: NASA POWER (A9); author's calculation.

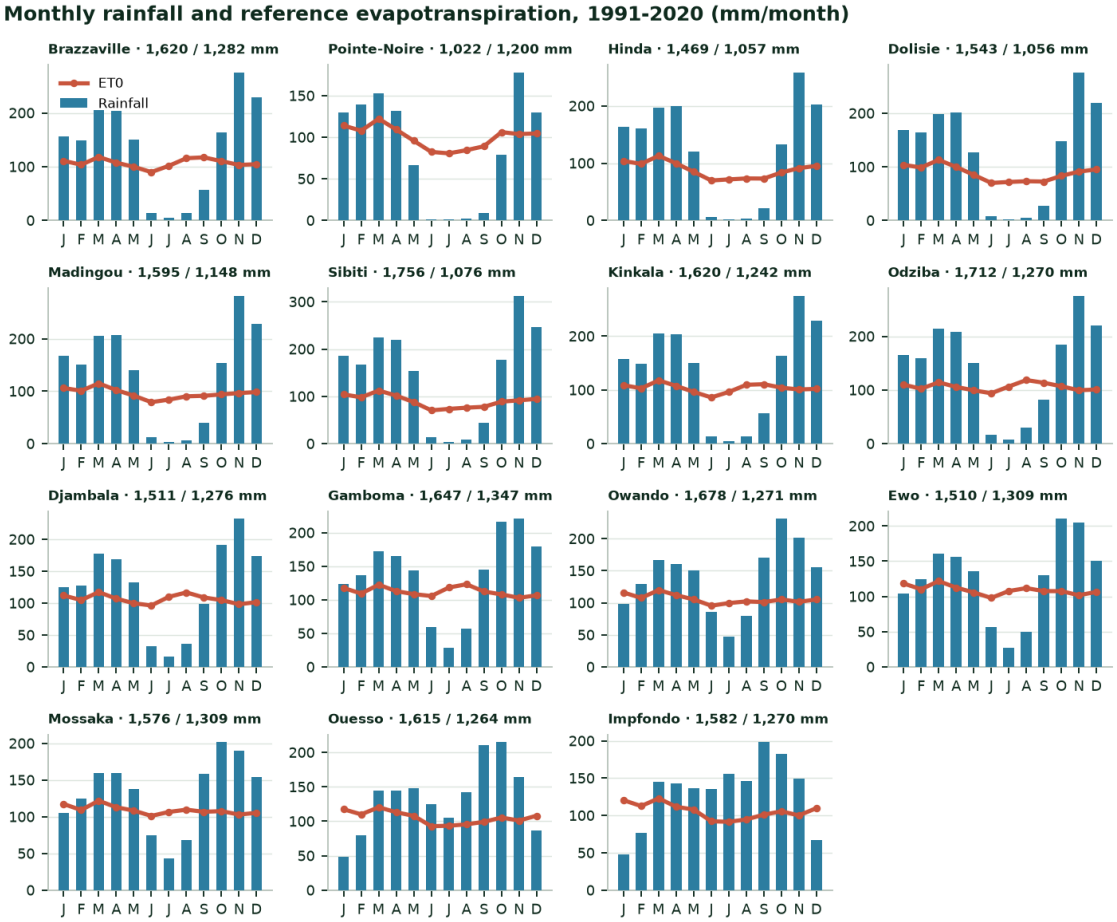


Figure 4. Monthly rainfall and reference evapotranspiration by city, 1991-2020. Source: NASA POWER (A9)

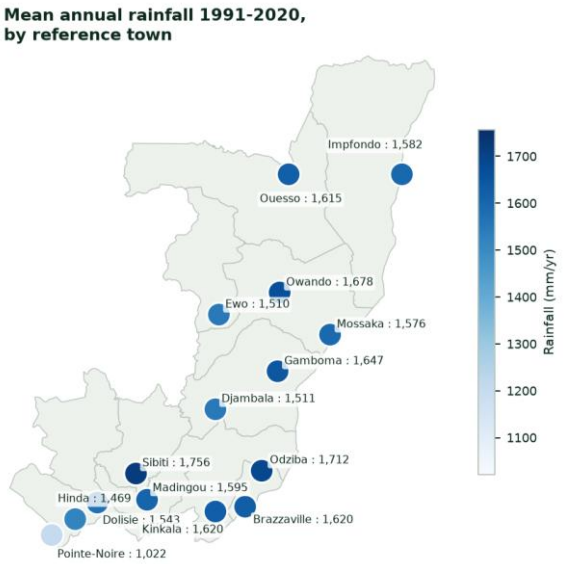


Figure 5. Mean annual rainfall 1991-2020, by region. Source: NASA POWER (A9), Natural Earth (A10).

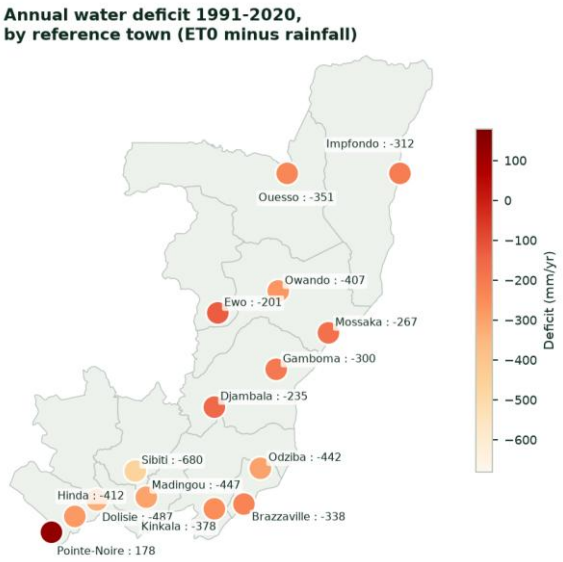


Figure 6. Annual water deficit, by region. Source: NASA POWER (A9), Natural Earth (A10).

3.3 Climate change

Mean annual temperature is rising. At Brazzaville it went from 23.8 °C in 1981 to 25.9 °C in 2024, a trend of 0.30 °C per decade. At Ouesso the trend is 0.27 °C per decade, from 24.0 °C to 26.0 °C. Warmer air dries the soil faster between rainfall events.

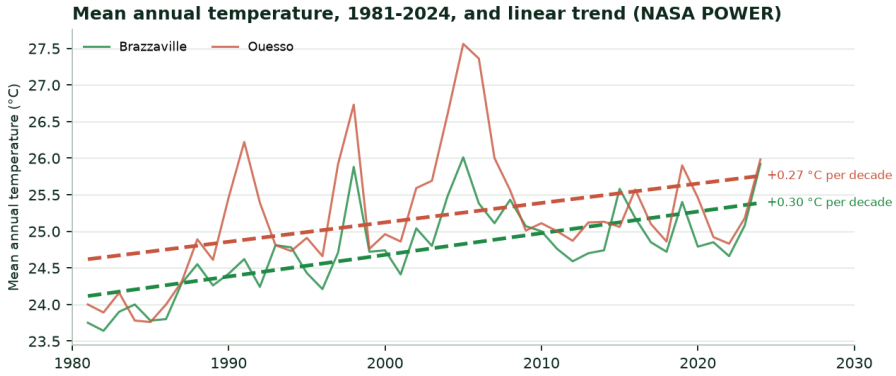


Figure 7. Mean annual temperature, 1981-2024, and linear trend. Source: NASA POWER (A9)



Dense forest around Sibiti (Lékoumou).

4. Water: Resources, irrigated areas, withdrawals

4.1 Resources and withdrawals

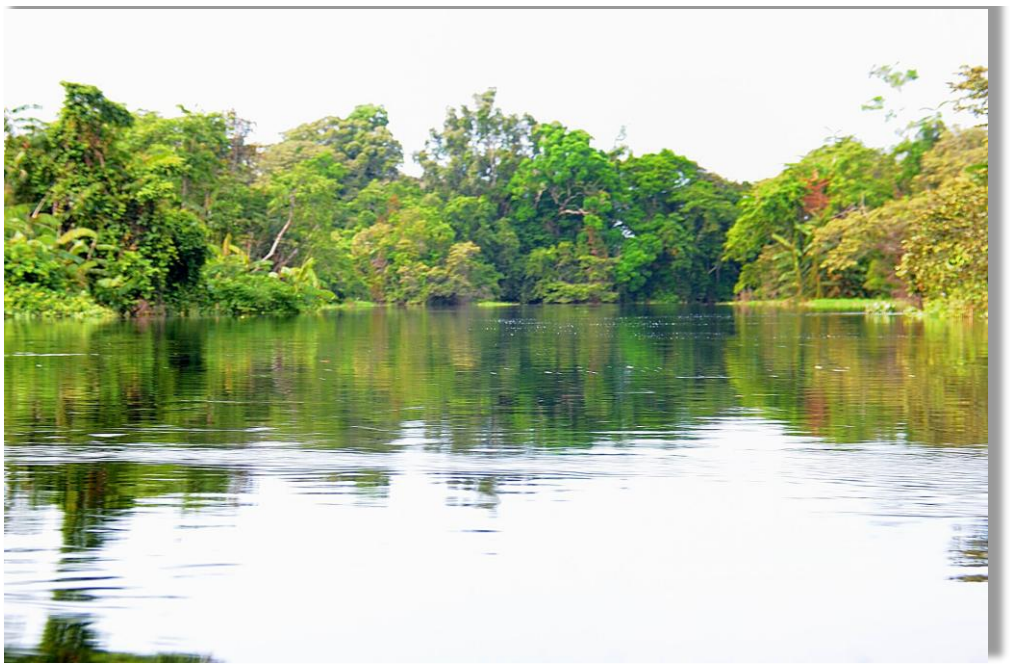
Total freshwater withdrawals are 46 million m³ a year (2022). Agriculture accounts for 4.4% of these withdrawals, that is 2 Mm³. Internal resources are 222.0 km³ a year and water stress is less than 0.1%: The country has water, but little of it is mobilised for crops.

Freshwater: Withdrawals and resources

Indicator	Value	Year	Source
Total withdrawals	46 Mm³	2022	World Bank (A1)
Agricultural share	4.4%	2022	World Bank (A1)
Agricultural withdrawals	2.0 Mm³	2022	Calculated from A1
Area equipped for irrigation	2,000 ha	2024	FAOSTAT (A6)
Agricultural withdrawals per equipped hectare	1,003 m³/ha	—	Calculation (Annex B)
Water stress	0.0%	2022	World Bank (A1)

4.2 Irrigated areas

FAOSTAT counts 2,000 hectares equipped for irrigation in 2024. In 2024, the area equipped for irrigation is 2,000 ha (A6), a tiny share of cropland. AQUASTAT placed 217 ha under full control near Brazzaville and Pointe-Noire, the rest being lowland sugar cane near Nkayi (A11). Cassava, groundnut, maize and tree crops are rainfed.



The Likouala-aux-Herbes River near Épéna.

4.3 What the water saving represents

In the central scenario, the saving is 0.3 million m³ a year, or 16.2% of agricultural withdrawals. At 1,003 m³ per equipped hectare, this water would irrigate about 324 more hectares, or 16.2% of today's equipped area.

5. Fertilisers: Quantities, purchases, spending

5.1 Quantities used

In 2024, agricultural use reaches 3,414 tonnes of nitrogen, 2,244 tonnes of phosphate (P2O5) and 4,856 tonnes of potash (K2O). The country produces no nitrogen fertiliser: It imported 3,414 tonnes of nitrogen in the same year. Per hectare of arable land, use is 19.1 kg per hectare.

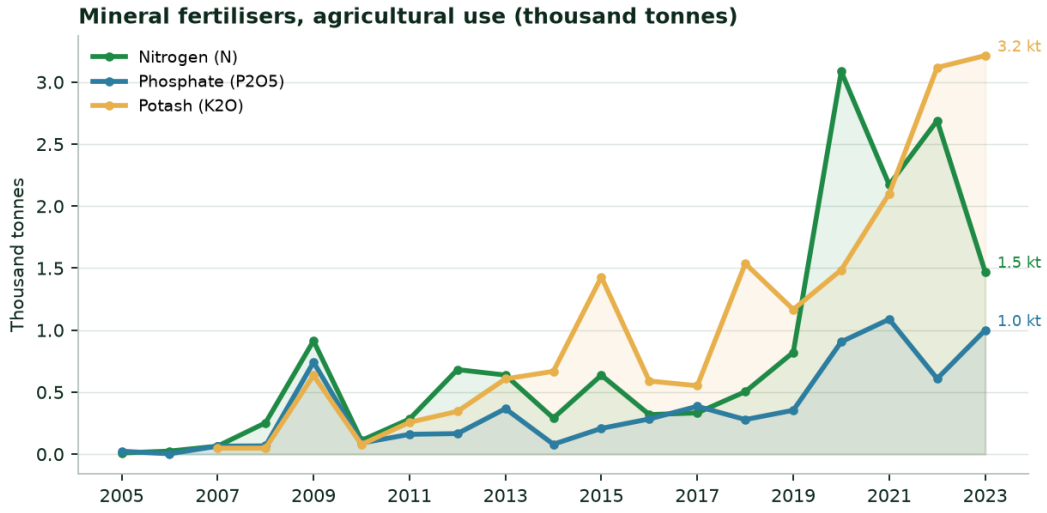


Figure 8. Mineral fertilisers, agricultural use, 2005-2023. Source: FAOSTAT (A5)

5.2 Regulatory framework

No text specific to fertilisers or water-retaining agents was found. The 2022 resilience plan describes the Congo as a large importer of food and fertilisers, and plans to strengthen fertiliser factories (A13). The applicable regime is to be confirmed with the Ministry of Agriculture.



Spring onion beds in Brazzaville.

5.3 Indicative spending

In 2024, the indicative minimum spending on mineral fertilisers reaches $7 million, at international fertiliser prices (calculation in Annex B, lower bound).

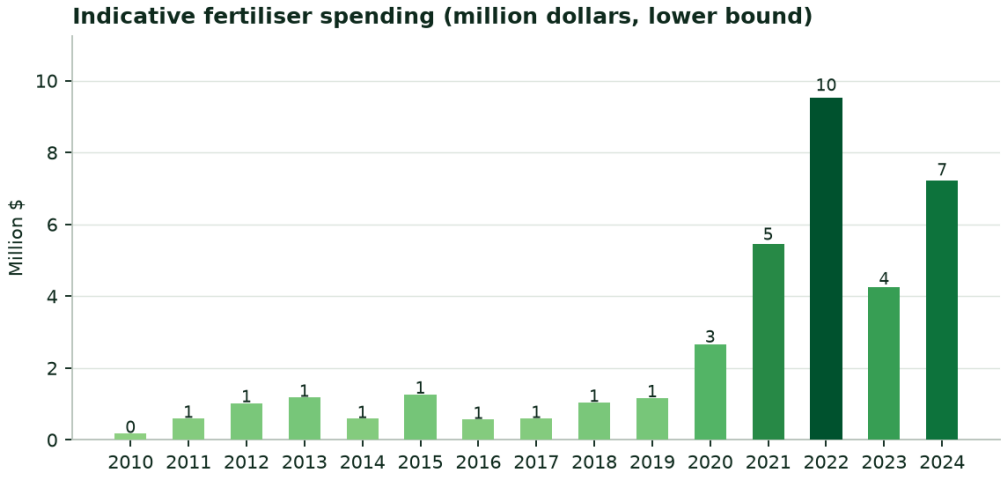


Figure 9. Indicative fertiliser spending, lower bound. Source: Author's calculation from A5 and A7

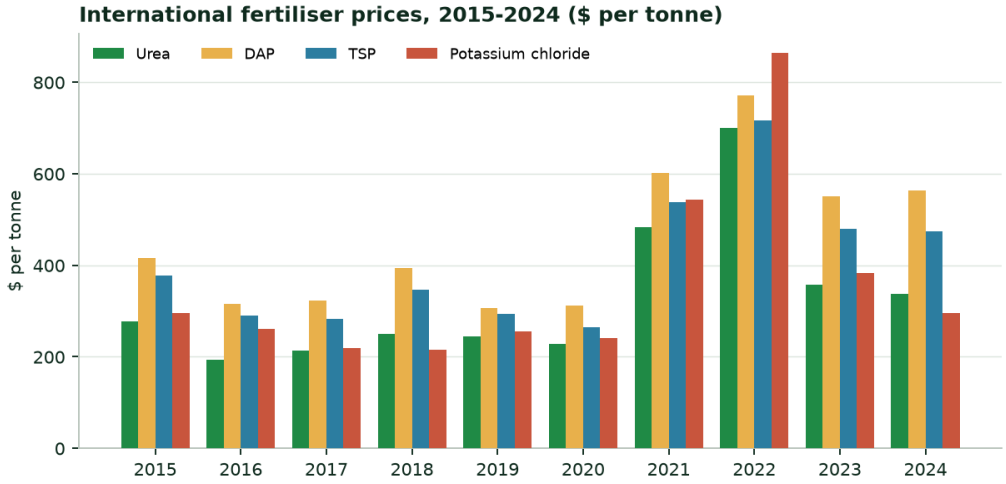


Figure 10. International prices of urea, DAP, TSP and potassium chloride. Source: World Bank, Pink Sheet (A7)

6. The regions at a glance

The table compares the 15 departments, each represented by its capital. Climate figures are 1991-2020 averages, except radiation (2005-2020).

Climate of the capitals, 1991-2020 means

Region (city)	Rainfall (mm/yr)	ET0 (mm/yr)	Deficit (mm/yr)	Radiation (kWh/m²/yr)	Temperature (°C)
Brazzaville (Brazzaville)	1,620	1,282	-338	1,866	24.9
Pointe-Noire (Pointe-Noire)	1,022	1,200	178	1,831	25.2
Kouilou (Hinda)	1,469	1,057	-412	1,598	24.6
Niari (Dolisie)	1,543	1,056	-487	1,759	25.0
Bouenza (Madingou)	1,595	1,148	-447	1,780	24.8
Lékoumou (Sibiti)	1,756	1,076	-680	1,632	24.3
Pool (Kinkala)	1,620	1,242	-378	1,788	24.9

Region (city)	Rainfall (mm/yr)	ET0 (mm/yr)	Deficit (mm/yr)	Radiation (kWh/m²/yr)	Temperature (°C)
Djoué-Léfini (Odziba)	1,712	1,270	-442	1,850	24.3
Plateaux (Djambala)	1,511	1,276	-235	1,817	24.6
Nkéni-Alima (Gamboma)	1,647	1,347	-300	1,941	25.2
Cuvette (Owando)	1,678	1,271	-407	1,916	25.6
Cuvette-Ouest (Ewo)	1,510	1,309	-201	1,912	25.6
Congo-Oubangui (Mossaka)	1,576	1,309	-267	1,919	26.6
Sangha (Ouesso)	1,615	1,264	-351	1,927	25.5
Likouala (Impfondo)	1,582	1,270	-312	1,935	26.1

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

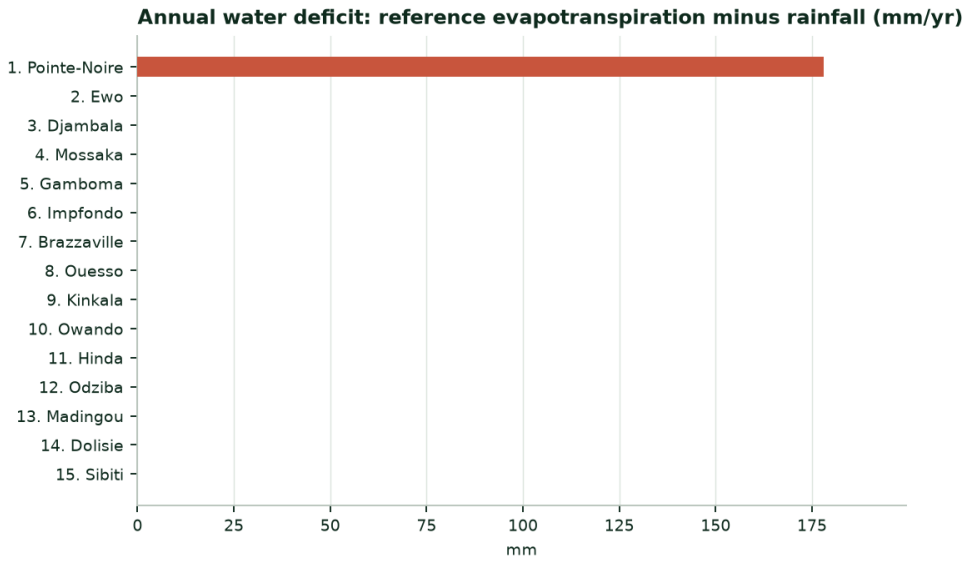


Figure 11. Annual water deficit: Reference evapotranspiration minus rainfall. Source: NASA POWER (A9)



A village on the Likouala-aux-Herbes River.

7. The twenty main crops: Three rankings

7.1 By harvested area

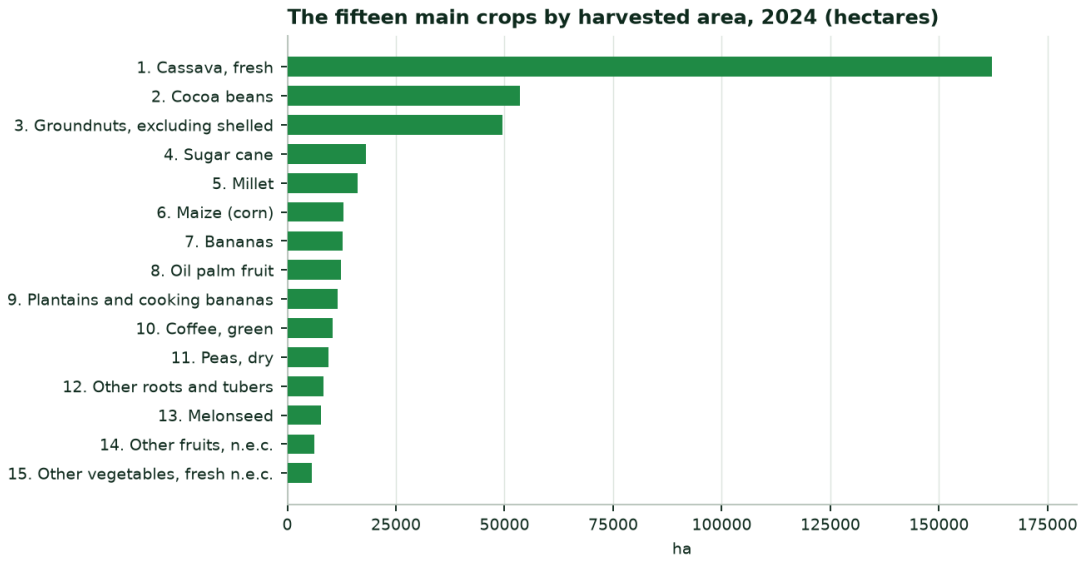


Figure 12. The fifteen main crops by harvested area, 2024 (hectares). Source: FAOSTAT (A2)

The ten main crops by area, 2024

Crop	Harvested area (ha)	Production (t)	Yield (t/ha)
Cassava, fresh	162,292	1,710,690	10.54
Cocoa beans	53,617	15,000	0.28
Groundnuts, excluding shelled	49,569	26,226	0.53
Sugar cane	18,186	677,152	37.23
Millet	16,118	13,706	0.85
Maize (corn)	13,000	13,000	1.00
Bananas	12,695	86,254	6.79
Oil palm fruit	12,438	155,084	12.47
Plantains and cooking bananas	11,563	84,570	7.31
Coffee, green	10,455	3,177	0.30

Source: FAOSTAT (A2).

7.2 By production

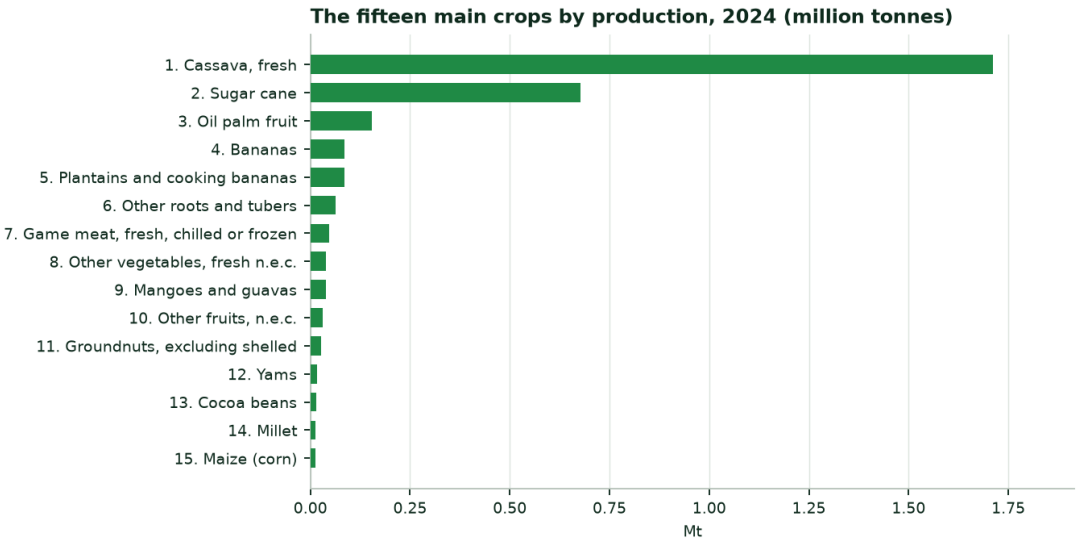


Figure 13. The fifteen main crops by production, 2024 (million tonnes). Source: FAOSTAT (A2)

7.3 By production value

By production value, the three main crops are: Cassava, fresh, plantains and cooking bananas and bananas (FAOSTAT, 2023, constant international dollars).

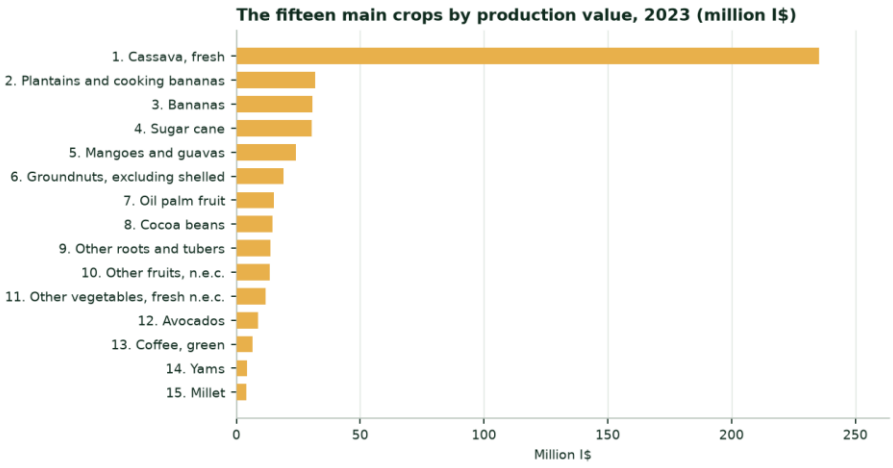


Figure 14. The fifteen main crops by production value, 2023 (million I$). Source: FAOSTAT (A3)



Vegetable growing on the Congo River, in Brazzaville.

8. Extrapolation by crop: Irrigation and rainfed crops

8.1 Method

Method in brief

• **Irrigation.** National agricultural water is shared between irrigated crops (vegetables, sugar cane and rice), in proportion to their harvested areas; the equipped area is shared the same way.

• **Rainfed crops.** For crops that have a trial (maize and potato), the production gain is calculated per 10,000 ha treated, at the national average 2024 yield.

• Each calculation applies the effect of the trial cited: A quarter (cautious), half (central) or the full effect (high). Without a trial: 5, 10 and 20% of water, with no yield gain.

8.2 Trials used as analogues

Trials cited and their use in the calculation

Trial	Crop	Water	Yield	Use in the calculation
Maize, Türkiye (TIGEM, Konya, 2025)	Maize	-38.9%	+17.1%	Maize: Yield
Soybean, China	Soybean	Assumption	+11.3%	Not used; cited for reference
Watermelon, Mexico (2023)	Watermelon	-60.5%	+30.0%	Vegetables: Water and yield
Potato, South Africa (2025)	Potato	-52.0%	+31.4%	Potato: Yield
Date palm, UAE (ICBA, 2021)	Palm	-82.0%	+20.0%	Not used; cited for reference

Source: A14 to A18 (published trials and manufacturer's website, levels B and C).

No trial has yet been conducted in Republic of the Congo: The figures below apply the results of the cited trials to the country's average yields.

8.3 Rainfed crops: Maize and Potato

Average 2024 yields (FAOSTAT): Maize 1.00 t/ha and potato 8.62 t/ha. A water-retention polymer retains water from each rainfall event near the roots and helps the crop through dry days during the season.

Extra production per 10,000 ha treated (tonnes a year)

Crop	Average yield (t/ha)	Cautious	Central	High
Maize	1.00	428	855	1,710
Potato	8.62	6,769	13,539	27,077

Source: FAOSTAT (A2); trials A14 to A18; author's calculation (Annex B).

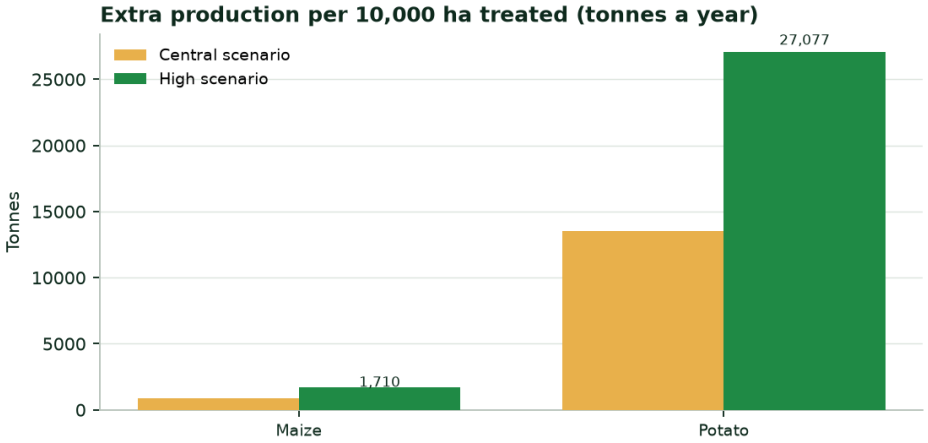


Figure 15. Extra production per 10,000 ha treated, central and high scenarios. Source: Author's calculation

8.4 Irrigation: Vegetables, Sugar cane and Rice

Equipped area assigned, trial used and water saved (central scenario)

Crop group	Equipped area (ha)	Share	Trial or assumption	Water saved (Mm³/yr)
Vegetables (tomato, onion, spring onion, others)	611	30.6%	Watermelon, Mexico (2023)	0.2
Sugar cane	1,264	63.2%	Generic assumption, no trial	0.1
Rice	125	6.2%	Generic assumption, no trial	0.0

Source: Author's calculation (Annex B).

Water saved, extra irrigable hectares and production gain, by scenario

Scenario	Water (Mm³/yr)	Extra hectares	Production (t/yr)
Cautious	0.2	162	295
Central	0.3	324	591
High	0.6	648	1,181

Source: Author's calculation (Annex B).

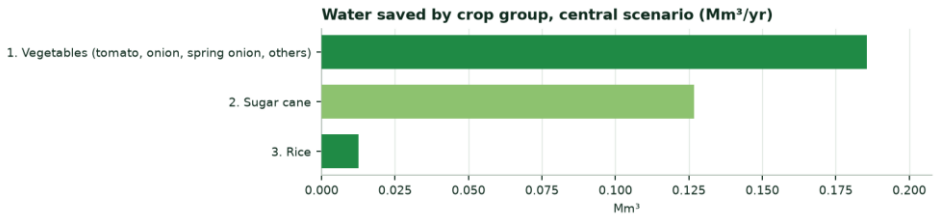


Figure 16. Water saved by crop group, central scenario. Source: Author's calculation

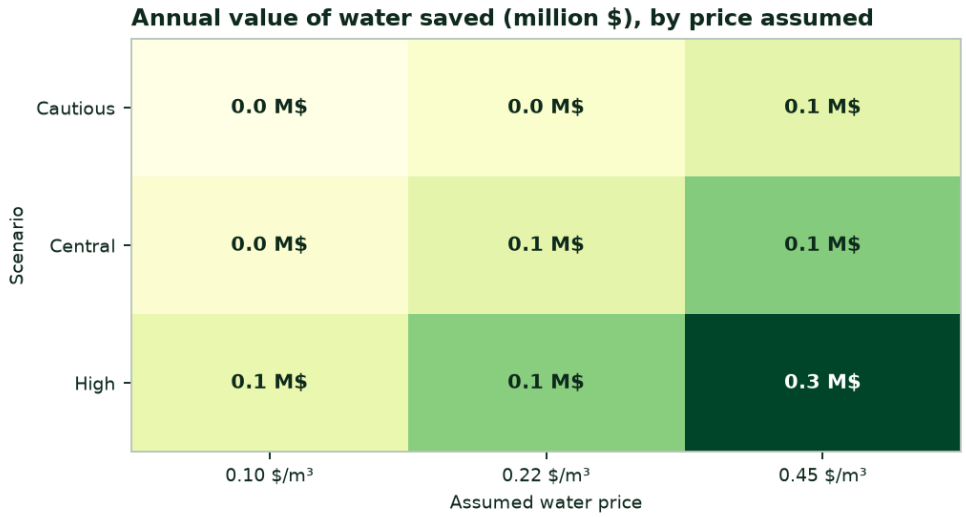


Figure 17. Annual value of the water saved, by price assumed per cubic metre. Source: Author's calculation; prices assumed, no national tariff

8.5 Reading the results

Key points

• In Republic of the Congo, the main challenge is rainfed farming: Only 2,000 ha are equipped for irrigation, for 652,510 ha of cropland.

• The "vegetables" group gives 57% of the irrigation water saving (watermelon, Mexico (2023)).

• The gains are counted by scenario and, in rainfed farming, per 10,000 ha treated: A cooperative or a public programme can scale them to its own area.

9. Potential benefits of our products

The table lists what the products may bring according to the documents available, with the confidence level and limitations of each.

Potential benefits, by situation

Benefit	Published figures	Source (level)	Limit
Irrigation water saving	Date palm −82%; watermelon −60.5%; potato −52%; maize −38.9%	A14 to A18 (B, C)	One trial per crop; none in Republic of the Congo
Yield	Maize +17.1%; potato +31.4%; watermelon +30%; date palm +20%; soybean +11.2 to +11.4%	A14 to A18 (B, C)	Trials conducted under irrigation or in other climates
Organic farming (ECOFERT®)	Certified by SOHISCERT and EU Bio	A21 (A)	Valid for the certified product
Safety: Acrylamide (ECOSORB®)	Below 3.0 µg/g	A19 (B)	One laboratory, one date
REACH compliance (EVERGREEN®)	≤ 0.1% of substances of very high concern in 233 substances tested	A20 (B)	Screening, not an approval
Agroforestry (Paulownia ALTIFOLIA®)	13 to 15 m in 6 to 8 years (website)	A22 (C)	No trial in Republic of the Congo

Source: Annex A.



A vegetable-growing area in Brazzaville.

10. External trade: Exports, imports, importing

10.1 Overview, 2023 and 2024

Agricultural products and total merchandise trade (million $)

Indicator	2023	2024
Agricultural exports (crops and livestock)	11	117
Agricultural imports (crops and livestock)	886	1,044
Exports, all merchandise	5,970	6,900
Imports, all merchandise	3,950	3,100

Source: FAOSTAT (A4).

10.2 Exports

The three main farm products exported in 2024 are: Cocoa beans ($80 million), coffee, green ($19 million) and bran of wheat ($5 million).

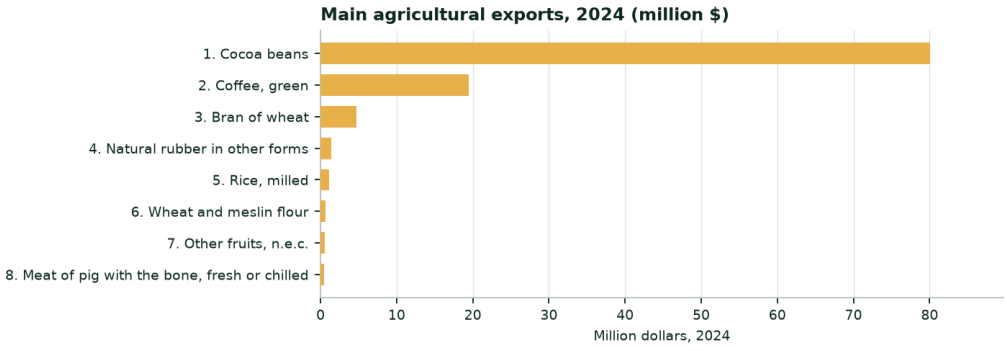


Figure 18. Main agricultural exports, 2024. Source: FAOSTAT (A4)

10.3 Imports

The main farm purchases are: Meat of chickens, fresh or chilled ($191 million), palm oil ($119 million) and wheat ($58 million). Rice weighs $70 million (husked, broken and milled rice): Every tonne grown locally reduces this bill.

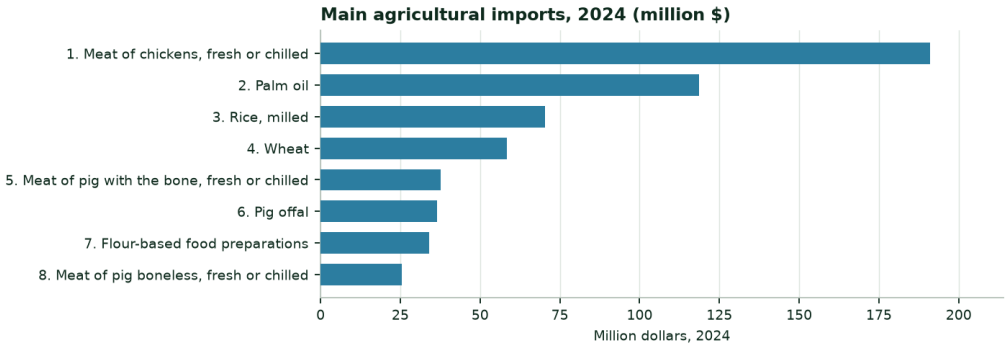


Figure 19. Main agricultural imports, 2024. Source: FAOSTAT (A4)



Bananas from Mouyondzi loaded for Pointe-Noire.



A market in the Congo.

10.4 Importing water-retention polymers into Republic of the Congo

What to know

• **Customs duty (subheading 3906.90):** 10% under the MFN tariff applied by the Republic of the Congo in 2023, the CEMAC common external tariff (A12).

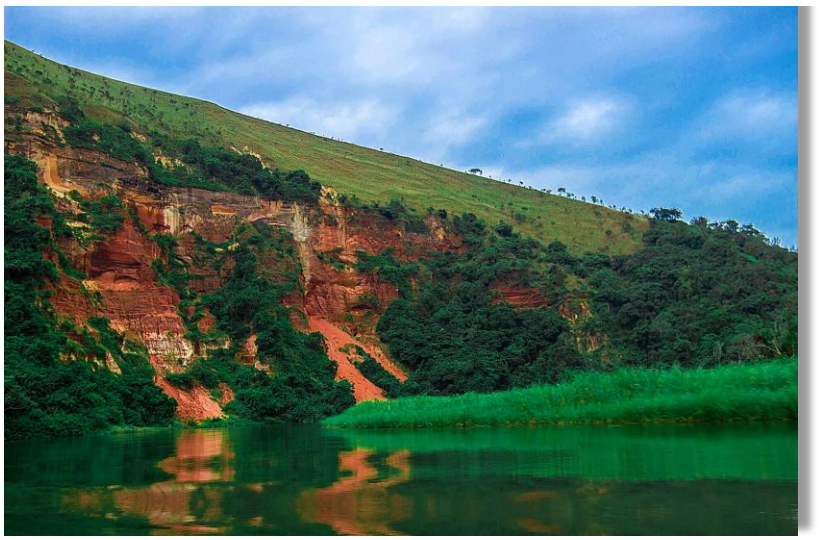
• **VAT:** 18%, plus a 5% surtax on the VAT, i.e. 18.9% in total (A12). Other community levies may apply on import; their amount is to be confirmed with a freight forwarder.

• **Placing on the market:** No text specific to fertilisers or water-retaining agents was found. The applicable regime is to be confirmed with the Ministry of Agriculture.

• **Classification:** Code 3906.90 is an inference for our products; Congolese Customs settles it.

11. A study of each region

Each region is described through the city that represents it. The figures describe the climate; the water deficit (evapotranspiration minus rainfall) shows where water is scarcest. The description of crops is qualitative.



The Léfini River.

Brazzaville (Brazzaville)

Brazzaville: Irrigated vegetable growing on the banks of the Congo River and in the city's valleys; the country's largest market.

Indicator	Value
Annual rainfall, 1991-2020	1,620 mm
Reference evapotranspiration	1,282 mm
Annual water deficit	-338 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,866 kWh/m²
Mean temperature	24.9 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Pointe-Noire (Pointe-Noire)

Pointe-Noire: Economic capital and port; peri-urban vegetable growing on sandy soils that hold water poorly.

Indicator	Value
Annual rainfall, 1991-2020	1,022 mm
Reference evapotranspiration	1,200 mm
Annual water deficit	178 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,831 kWh/m²
Mean temperature	25.2 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Kouilou (Hinda)

Kouilou: Cassava, bananas and oil palm, between the coast, the lagoons and the Mayombe.

Indicator	Value
Annual rainfall, 1991-2020	1,469 mm
Reference evapotranspiration	1,057 mm

Indicator	Value
Annual water deficit	-412 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,598 kWh/m²
Mean temperature	24.6 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Niari (Dolisie)

Niari: Cassava, groundnut, maize and bananas in the Niari valley, livestock in the savannahs.

Indicator	Value
Annual rainfall, 1991-2020	1,543 mm
Reference evapotranspiration	1,056 mm
Annual water deficit	-487 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,759 kWh/m²
Mean temperature	25.0 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Bouenza (Madingou)

Bouenza: Irrigated sugar cane near Nkayi, cassava, groundnut, beans and bananas.

Indicator	Value
Annual rainfall, 1991-2020	1,595 mm
Reference evapotranspiration	1,148 mm
Annual water deficit	-447 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,780 kWh/m²
Mean temperature	24.8 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Lékoumou (Sibiti)

Lékoumou: Forest; cassava, plantain, cocoa and coffee.

Indicator	Value
Annual rainfall, 1991-2020	1,756 mm
Reference evapotranspiration	1,076 mm
Annual water deficit	-680 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,632 kWh/m²
Mean temperature	24.3 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Pool (Kinkala)

Pool: Cassava, groundnut, beans and vegetables for the Brazzaville market.

Indicator	Value
Annual rainfall, 1991-2020	1,620 mm
Reference evapotranspiration	1,242 mm
Annual water deficit	-378 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,788 kWh/m²
Mean temperature	24.9 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Djoué-Léfini (Odziba)

Djoué-Léfini: Sandy plateaus; cassava, groundnut, vegetables and livestock, near Brazzaville.

Indicator	Value
Annual rainfall, 1991-2020	1,712 mm
Reference evapotranspiration	1,270 mm
Annual water deficit	-442 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,850 kWh/m²
Mean temperature	24.3 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Plateaux (Djambala)

Plateaux: Batéké plateaus; cassava, groundnut, maize and livestock, on sandy soils that hold water poorly.

Indicator	Value
Annual rainfall, 1991-2020	1,511 mm
Reference evapotranspiration	1,276 mm
Annual water deficit	-235 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,817 kWh/m²
Mean temperature	24.6 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Nkéni-Alima (Gamboma)

Nkéni-Alima: Cassava, maize, groundnut and oil palm, between plateaus and valleys.

Indicator	Value
Annual rainfall, 1991-2020	1,647 mm
Reference evapotranspiration	1,347 mm
Annual water deficit	-300 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,941 kWh/m²
Mean temperature	25.2 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Cuvette (Owando)

Cuvette: Cassava, oil palm, cocoa and fishing in the Congo basin lowlands.

Indicator	Value
Annual rainfall, 1991-2020	1,678 mm
Reference evapotranspiration	1,271 mm
Annual water deficit	-407 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,916 kWh/m²
Mean temperature	25.6 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Cuvette-Ouest (Ewo)

Cuvette-Ouest: Forests and savannahs; cassava, bananas and cocoa.

Indicator	Value
Annual rainfall, 1991-2020	1,510 mm
Reference evapotranspiration	1,309 mm
Annual water deficit	-201 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,912 kWh/m²
Mean temperature	25.6 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Congo-Oubangui (Mossaka)

Congo-Oubangui: Floodplains around the confluence; fishing, cassava and flood-recession crops.

Indicator	Value
Annual rainfall, 1991-2020	1,576 mm
Reference evapotranspiration	1,309 mm
Annual water deficit	-267 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,919 kWh/m²
Mean temperature	26.6 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Sangha (Ouesso)

Sangha: Dense forest; cocoa, coffee, oil palm and cassava.

Indicator	Value
Annual rainfall, 1991-2020	1,615 mm
Reference evapotranspiration	1,264 mm
Annual water deficit	-351 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,927 kWh/m²
Mean temperature	25.5 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Likouala (Impfondo)

Likouala: Flooded forests; cassava, bananas, cocoa and fishing.

Indicator	Value
Annual rainfall, 1991-2020	1,582 mm
Reference evapotranspiration	1,270 mm
Annual water deficit	-312 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,935 kWh/m²
Mean temperature	26.1 °C

Source: NASA POWER (A9); PVGIS (A8); author's calculation.

Annex A. Sources and confidence levels

Ref.	Source	Level
A1	World Bank, World Development Indicators (WDI), Republic of the Congo	A
A2	FAOSTAT, crops and livestock (QCL), areas, production, 2014-2024	A
A3	FAOSTAT, value of production (QV), constant 2014-2016 I$, 2019-2024	A
A4	FAOSTAT, trade in crops and livestock products, 2018-2024	A
A5	FAOSTAT, mineral fertilisers, agricultural use, production and imports, 2005-2023	A
A6	FAOSTAT, land use, areas equipped for irrigation, organic farming	A
A7	World Bank, Pink Sheet (world prices of urea, DAP, TSP and potassium chloride)	A
A8	PVGIS (European Commission Joint Research Centre), radiation, 2005-2020	B
A9	NASA POWER (NASA Langley Research Center), daily data: Rainfall, temperature, humidity, wind and radiation, 1981-2024; reference evapotranspiration calculated by the author with FAO-56 (Penman-Monteith)	B
A10	Natural Earth, first-level administrative boundaries and country outline	B
A11	FAO, AQUASTAT, irrigation by country, Republic of the Congo: 2,000 ha equipped and irrigated (2003), of which 217 ha under full control near Brazzaville and Pointe-Noire, the rest lowland sugar cane near Nkayi	A
A12	World Bank, WITS (UNCTAD TRAINS database), Republic of the Congo, applied MFN duties, subheading 3906.90, 2023; PwC, Worldwide Tax Summaries, Republic of the Congo: 18% VAT and 5% surtax	A
A13	Decree No. 2022-370 of 29 June 2022 approving the resilience plan for the food crisis 2022-2023 (Official Journal of the Republic of the Congo)	A
A14	Soybean trial, China (yield), manufacturer's website	C
A15	Date palm trial, UAE (ICBA, 2021), manufacturer's website	B
A16	Watermelon trial, Mexico (2023), manufacturer's website	C
A17	Potato trial, South Africa (2025), manufacturer's website	C
A18	Maize trial, Türkiye (TIGEM, Konya, 2025), manufacturer's website	B
A19	ECOSORB® acrylamide analysis (Polymex laboratory, 2024)	B
A20	EVERGREEN® REACH / SVHC screening (SGS, 2023)	B
A21	ECOFERT® certificate (SOHISCERT, EU Bio)	A
A22	Paulownia ALTIFOLIA® sheet figures (website)	C

Annex B. Calculation method

1. Agricultural water. Total withdrawals (46 Mm³, 2022) × agricultural share (4.36%) = 2.0 Mm³.

2. Irrigation. The equipped area (2,000 ha) and agricultural water are shared between irrigated groups (vegetables, sugar cane and rice) in proportion to their harvested areas (28,770 ha), without exceeding each group's harvested area. Our sources provide no irrigation statistics by crop. Other crops are treated as rainfed and receive no irrigation water in the calculation. The equipped area is much smaller than the harvested area of irrigable crops (vegetables, sugar cane, rice): It is shared among them pro rata, and the rest of their area is rainfed. Maize and potato are treated as rainfed: Their yield gain is given for 10,000 ha treated.

3. Scenarios. Water saved = group water × trial effect: A quarter (cautious), half (central) or the full effect (high). Without a trial: 5, 10 and 20%.

4. Extra hectares. Water saved ÷ water per equipped hectare (1,003 m³/ha).

5. Rainfed crops. Gain per 10,000 ha = 10,000 × average 2024 yield (production ÷ harvested area, FAOSTAT) × trial effect on yield (maize 17.1% and potato 31.4%), using the same quarter, half and full trial effect.

6. Value of water. Three assumed prices (0.10; 0.22 and 0.45 $/m³); no national tariff was adopted.

7. Fertilisers. Minimum spending = nitrogen ÷ 0.46 × urea price + phosphate ÷ 0.46 × TSP price + potash ÷ 0.60 × potassium chloride price (A7).

8. Climate. Rainfall, reference evapotranspiration (FAO-56) and temperature: 1991-2020 means of the NASA POWER grid cell containing each city; radiation: PVGIS, 2005-2020. Temperature trends are linear regressions over 1981-2024. NASA POWER combines reanalyses and satellite data on a grid of about 50 km: Two nearby cities can share the same cell, and its rainfall can differ from local station records. On the maps, each disc represents the capital of a department.

9. Trade. Totals are those of the FAOSTAT crops and livestock line; products are listed one by one, without aggregates. Rice amounts add husked rice, broken rice and milled rice.

Annex C. Photo credits

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Bel vue sur la zone agricole de Brazzaville.jpg	BOKOBA veroly	CC BY-SA 4.0
Zone agricole de Brazzaville.jpg	BOKOBA veroly	CC BY-SA 4.0
Dunda bari, légumes planté au bord du fleuve Congo Brazzaville.jpg	BOKOBA veroly	CC BY-SA 4.0
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Likouala-aux-Herbes River near Epena, Republic of the Congo.jpg	JosepMGracia	CC BY-SA 4.0
Bilanga ya Brazzaville Congo.jpg	BOKOBA veroly	CC BY-SA 4.0
Traditional riverside village on the Likouala-aux-Herbes River.jpg	JosepMGracia	CC BY-SA 4.0
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Zone agricole maraîchageuse de la ville de Brazzaville Congo.jpg	BOKOBA veroly	CC BY-SA 4.0
Mouyondzi. Chargement de régimes de bananes à destination de Pointe-No	Boussou Gaston	CC BY-SA 4.0
ZANDU (Marché).jpg	Verhody	CC BY-SA 4.0
Lefini River (25583791068).jpg	Forest Service, USDA	Public domain
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The gardens of the Brazzaville corniche.

Green Solutions

contact@green-solutions-group.com · green-solutions-group.com