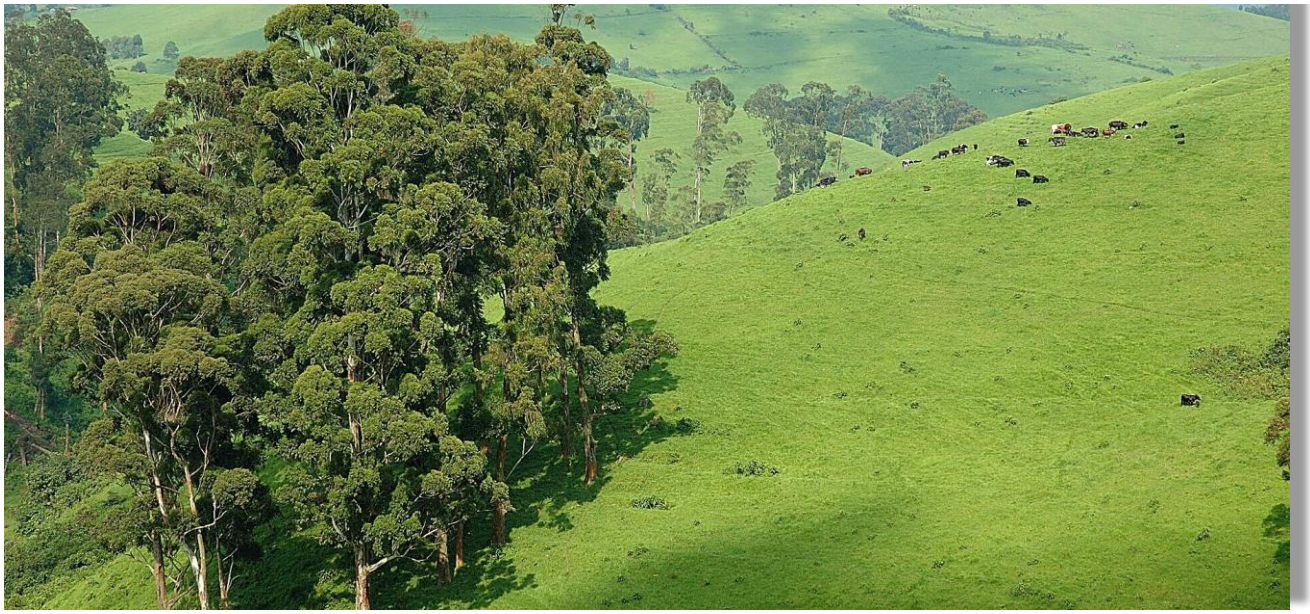


COUNTRY DOSSIER

Democratic 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 Masisi hills (North Kivu), between pastures and fields.

Foreword

This dossier describes Democratic 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, INERA)).
- **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 Democratic 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, INERA), PVGIS and NASA POWER. The production gains and water savings are scenarios, described in Annex B.

112.83 M
Inhabitants in 2025 (World Bank)

5.71 M ha
Of cassava, fresh harvested in 2024, the main crop

11,000 ha
Equipped for irrigation (2024)

+657 t
Of maize per 10,000 ha treated, central scenario

7.9 Mm³
Of irrigation water saved a year, central scenario

359 M$
Of agricultural exports in 2024 (FAOSTAT)

Key points

• **Predominantly rainfed farming.** 11,000 ha equipped for irrigation in 2024, for 18.51 million hectares of cropland: Almost every harvest depends on rain.

• **Cassava, fresh: The main crop.** 5,710,796 ha harvested in 2024, for 46.56 million tonnes, or 8.15 t/ha.

• **Water is not scarce over the year as a whole; it is scarce between rainfall events.** National water stress is only 0.2%, but at Kalemie, atmospheric water demand exceeds rainfall by 579 mm.

• **In rainfed farming, the gain is counted in tonnes.** In the central scenario, 657 t of maize, 315 t of soybean and 7,180 t of potato more per 10,000 ha treated.

• **In irrigated farming, the water saved could allow irrigation schemes to be expanded.** 7.9 Mm³ a year in the central scenario, enough to irrigate about 1,201 more ha, or 10.9% of the equipped area.

• **An organic supply chain.** 103,360 ha of certified organic cropland in 2024: ECOFERT® is EU Bio certified.

• **All nitrogen is imported.** 32,284 t of nitrogen used in 2024, 32,293 t imported, no national production.

• **Farm trade.** $359 million of exports and $1,289 million of imports in 2024. Leading export: Cocoa beans ($298 million). Leading import: Wheat ($117 million).

Key figures

Key indicators for Democratic Republic of the Congo

Indicator	Value	Year	Source (level)
Population	112.83 M	2025	World Bank (A1)
GDP per capita	807 $	2025	World Bank (A1)
Agriculture's share of GDP	8.9%	2025	World Bank (A1)
Agricultural employment	58.5%	2025	World Bank (A1)
Cropland	18,509,470 ha	2024	FAOSTAT (A6)
Area equipped for irrigation	11,000 ha	2024	FAOSTAT (A6)
Harvested area: Cassava, fresh	5,710,796 ha	2024	FAOSTAT (A2)
Certified organic cropland	103,360 ha	2024	FAOSTAT (A6)
Agricultural exports	359 M$	2024	FAOSTAT (A4)

Indicator	Value	Year	Source (level)
Agricultural imports	1,289 M$	2024	FAOSTAT (A4)
Mineral nitrogen, agricultural use	32,284 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 Democratic 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.



A pineapple farmer in the Democratic Republic of the Congo.

2. Democratic Republic of the Congo in figures

Democratic Republic of the Congo had 112.83 million inhabitants in 2025, 55% of them in rural areas. Agriculture accounts for 8.9% of gross domestic product and employs 59% of the labour force. The country covers 2,267.1 thousand km², of which 16% is agricultural land. Undernourishment affects 39.5% of the population.

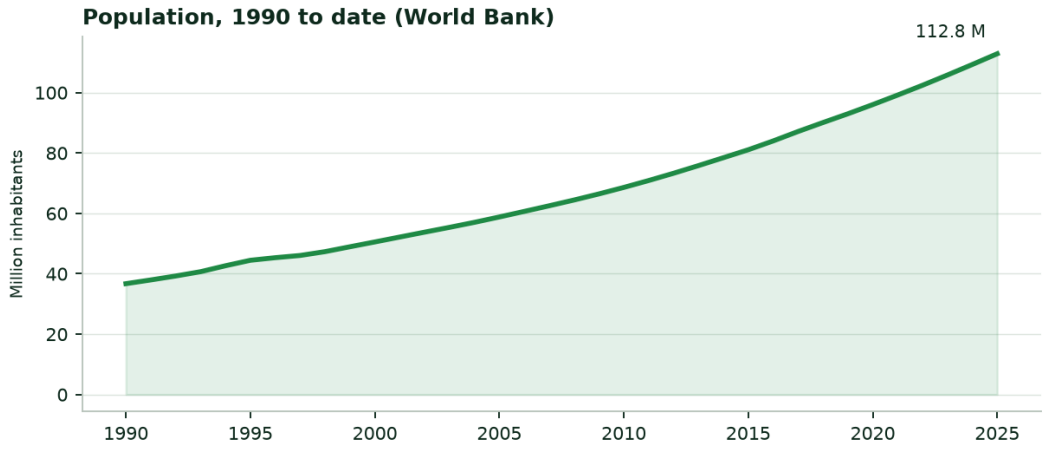


Figure 1. Population of Democratic Republic of the Congo, 1990 to date. Source: World Bank (A1)

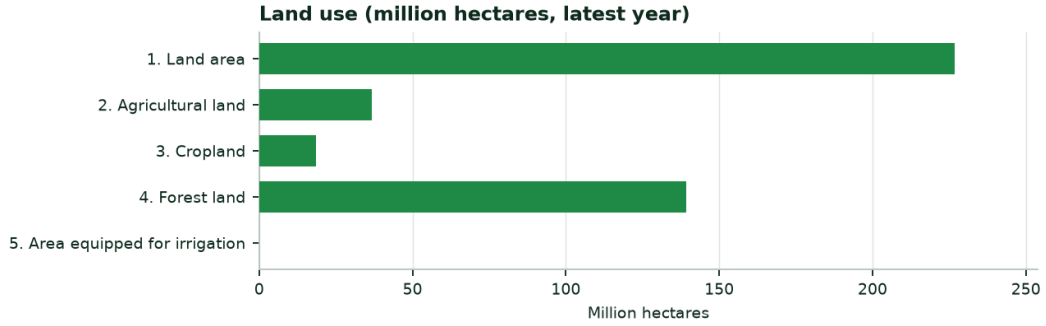


Figure 2. Land use, latest year published. Source: FAOSTAT (A6)

Agricultural and water indicators, latest year published

Indicator	Value	Year	Source
Cropland certified organic	103,360 ha	2024	FAOSTAT (A6)
Average cereal yield	872 kg/ha	2024	World Bank (A1)
Fertiliser use per hectare of arable land	2.5 kg/ha	2024	World Bank (A1)
Water withdrawals, agricultural share	10.5%	2022	World Bank (A1)
Internal freshwater resources	900.0 km³	2022	World Bank (A1)
Internal resources per inhabitant	8,789 m³	2022	World Bank (A1)



A family working its fields near Kalemie (Tanganyika).

3. Sunshine, rainfall and climate change

3.1 Sunshine

Global solar radiation reaches 1,815 to 2,188 kWh/m² a year depending on the region. Energy is not the limit: Water available at the right time makes the harvest.

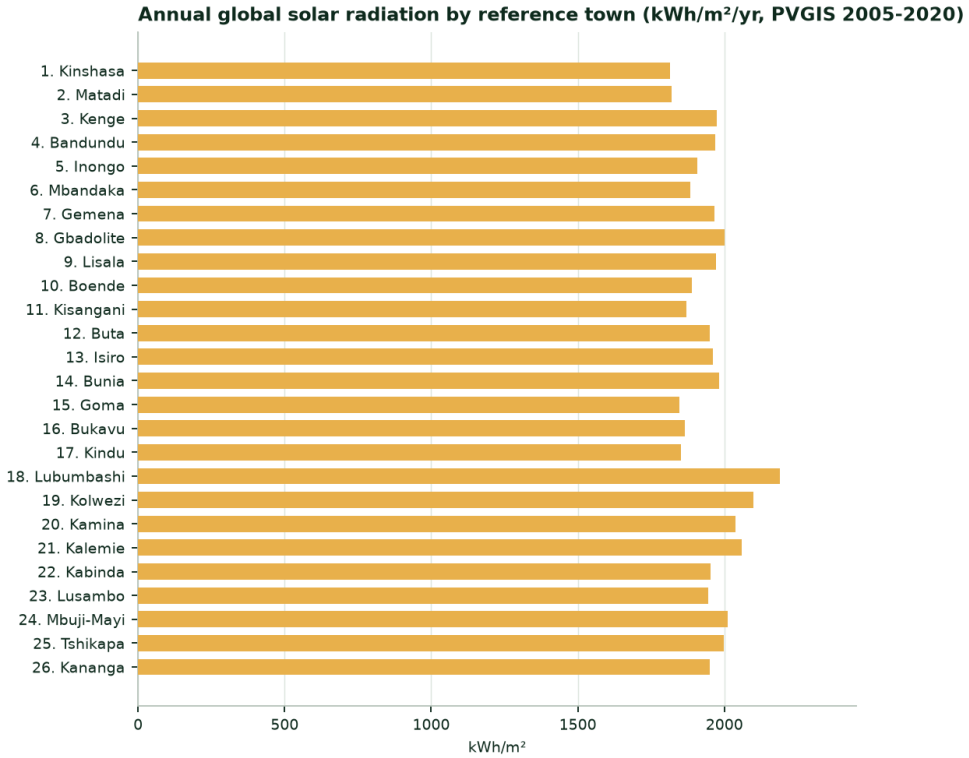


Figure 3. Annual global solar radiation in each reference town. Source: PVGIS (A8)

3.2 Rainfall and evapotranspiration

It rains 1,938 mm a year at Isiro, but only 1,116 mm at Matadi, where reference evapotranspiration reaches 1,157 mm. The centre of the country, on the equator, gets rain all year. North of the equator, the dry season

runs from December to February; south of it, it lengthens from June to August in Kinshasa to five or six months in Katanga (May to October). The Kivu and Ituri highlands have two cropping seasons.



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

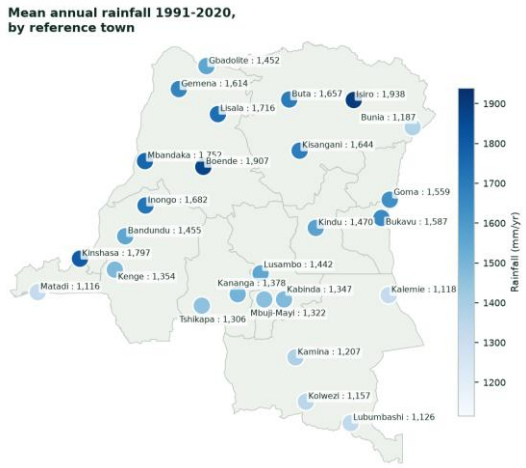


Figure 5. Mean annual rainfall 1991-2020, by region. Source: NASA POWER (A9), Natural Earth (A10).

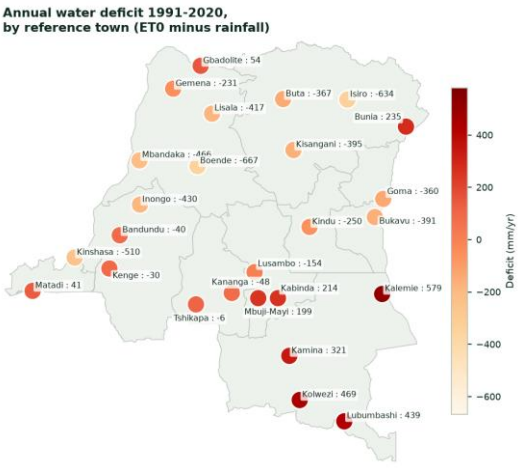


Figure 6. Annual water deficit, by region. Source: NASA POWER (A9), Natural Earth (A10).

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

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kinshasa	170	164	220	221	158	15	6	22	74	192	307	249
Matadi	117	110	179	170	109	5	1	5	20	88	168	143
Kenge	134	125	180	170	102	13	8	24	74	151	203	170
Bandundu	132	129	171	164	124	29	16	52	114	165	194	165
Inongo	121	134	171	165	139	74	56	93	172	193	196	170
Mbandaka	89	122	162	163	151	128	121	132	191	194	177	123
Gemena	30	64	134	151	159	159	181	198	190	209	108	32
Gbadolite	18	33	107	137	168	156	175	189	175	182	91	22
Lisala	50	86	150	150	164	158	187	180	177	180	156	79
Boende	101	129	158	154	175	147	149	172	187	197	193	145
Kisangani	71	104	153	179	140	127	118	141	156	189	157	109
Buta	28	51	128	189	189	155	163	185	178	240	117	34
Isiro	43	63	152	235	219	185	167	198	206	248	166	56
Bunia	41	47	113	127	118	84	87	112	121	141	128	68
Goma	129	123	190	166	139	60	38	78	123	166	201	147
Bukavu	157	145	186	169	119	43	27	63	110	163	235	170
Kindu	134	141	175	143	76	26	34	91	135	162	191	160
Lubumbashi	251	208	186	54	5	0	0	1	3	27	129	262
Kolwezi	234	169	173	59	4	0	0	4	12	67	184	250
Kamina	188	174	190	96	8	1	1	7	41	114	185	201
Kalemie	169	139	171	123	25	3	1	7	20	75	206	179
Kabinda	167	159	169	139	40	9	4	48	103	147	186	176
Lusambo	151	156	158	125	58	18	17	76	137	166	202	177
Mbuji-Mayi	159	158	162	120	38	8	5	49	112	145	192	173
Tshikapa	152	140	170	143	45	6	5	36	106	146	188	168
Kananga	159	153	163	120	43	8	7	59	128	157	206	174

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

3.3 Climate change

Mean annual temperature is rising. At Kinshasa it went from 23.6 °C in 1981 to 25.9 °C in 2024, a trend of 0.25 °C per decade. At Lubumbashi the trend is 0.17 °C per decade, from 20.0 °C to 21.6 °C. Warmer air dries the soil faster between rainfall events.

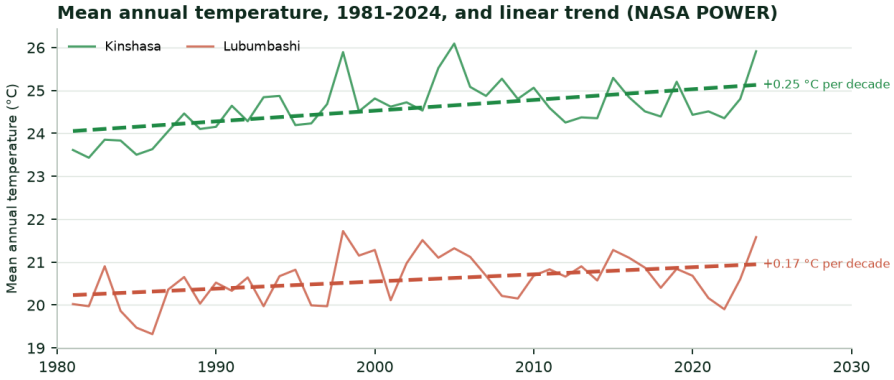


Figure 7. Mean annual temperature, 1981-2024, and linear trend. Source: NASA POWER (A9)



Lake Kivu, on the Congolese side.

4. Water: Resources, irrigated areas, withdrawals

4.1 Resources and withdrawals

Total freshwater withdrawals are 684 million m³ a year (2022). Agriculture accounts for 10.5% of these withdrawals, that is 72 Mm³. Internal resources are 900.0 km³ a year and water stress is 0.2%: The country has water, but little of it is mobilised for crops.

Freshwater: Withdrawals and resources

Indicator	Value	Year	Source
Total withdrawals	684 Mm³	2022	World Bank (A1)
Agricultural share	10.5%	2022	World Bank (A1)
Agricultural withdrawals	71.9 Mm³	2022	Calculated from A1
Area equipped for irrigation	11,000 ha	2024	FAOSTAT (A6)
Agricultural withdrawals per equipped hectare	6,536 m³/ha	—	Calculation (Annex B)
Water stress	0.2%	2022	World Bank (A1)

4.2 Irrigated areas

FAOSTAT counts 11,000 hectares equipped for irrigation in 2024. In 2024, the area equipped for irrigation is 11,000 ha (A6), a tiny share of cropland. AQUASTAT recorded 6,800 ha actually irrigated in 2000, entirely from surface water (A11). Irrigation serves mostly sugar cane, rice in a few plains (Ruzizi) and vegetables around the towns; cassava, maize and the other crops are rainfed.



Dugout canoes on the Congo River.

4.3 What the water saving represents

In the central scenario, the saving is 7.9 million m³ a year, or 10.9% of agricultural withdrawals. At 6,536 m³ per equipped hectare, this water would irrigate about 1,201 more hectares, or 10.9% of today's equipped area.

5. Fertilisers: Quantities, purchases, spending

5.1 Quantities used

In 2024, agricultural use reaches 32,284 tonnes of nitrogen, 4,807 tonnes of phosphate (P2O5) and 4,443 tonnes of potash (K2O). The country produces no nitrogen fertiliser: It imported 32,293 tonnes of nitrogen in the same year. Per hectare of arable land, use is 2.5 kg per hectare.

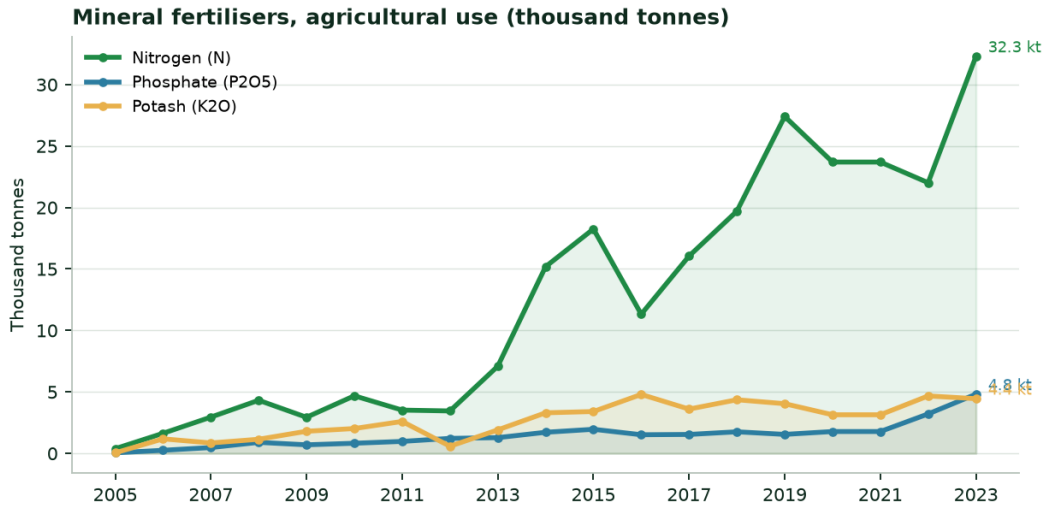


Figure 8. Mineral fertilisers, agricultural use, 2005-2023. Source: FAOSTAT (A5)

5.2 Regulatory framework

Law No. 11/022 of 24 December 2011 provides for a national system for registering and controlling agricultural inputs, including fertilisers, before use; a decree sets the rules (Article 30, A13). The regime for a water-retaining polymer is to be confirmed with the Ministry of Agriculture.



A field of disease-resistant cassava varieties.

5.3 Indicative spending

In 2024, the indicative minimum spending on mineral fertilisers reaches $31 million, at international fertiliser prices (calculation in Annex B, lower bound).

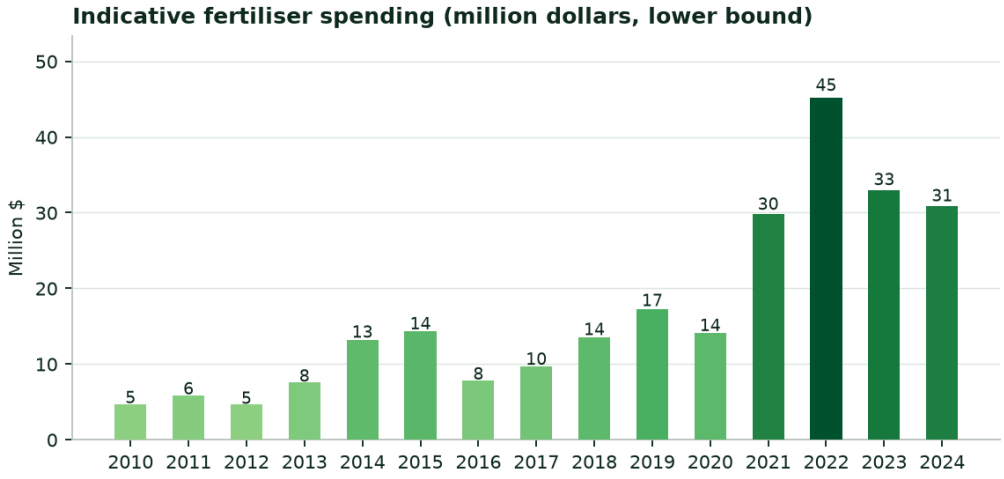


Figure 9. Indicative fertiliser spending, lower bound. Source: Author's calculation from A5 and A7

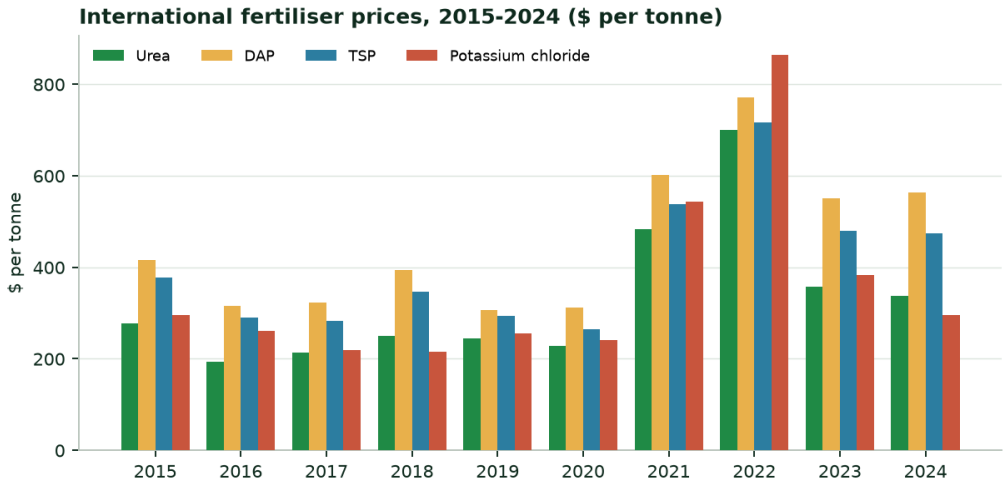


Figure 10. International prices of urea, DAP, TSP and potassium chloride. Source: World Bank, Pink Sheet (A7)

6. The regions at a glance

The table compares the 26 provinces, 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)
Kinshasa (Kinshasa)	1,797	1,287	-510	1,815	24.8
Kongo Central (Matadi)	1,116	1,157	41	1,821	25.3
Kwango (Kenge)	1,354	1,324	-30	1,973	25.2
Kwilu (Bandundu)	1,455	1,415	-40	1,968	26.7
Mai-Ndombe (Inongo)	1,682	1,252	-430	1,908	26.3
Équateur (Mbandaka)	1,752	1,286	-466	1,885	26.2
Sud-Ubangi (Gemena)	1,614	1,383	-231	1,965	25.6
Nord-Ubangi (Gbadolite)	1,452	1,506	54	2,002	25.8
Mongala (Lisala)	1,716	1,299	-417	1,971	25.5
Tshuapa (Boende)	1,907	1,240	-667	1,889	25.1

Region (city)	Rainfall (mm/yr)	ET0 (mm/yr)	Deficit (mm/yr)	Radiation (kWh/m²/yr)	Temperature (°C)
Tshopo (Kisangani)	1,644	1,249	-395	1,870	24.9
Bas-Uele (Buta)	1,657	1,290	-367	1,950	24.5
Haut-Uele (Isiro)	1,938	1,304	-634	1,962	23.2
Ituri (Bunia)	1,187	1,422	235	1,981	22.6
North Kivu (Goma)	1,559	1,199	-360	1,846	17.5
South Kivu (Bukavu)	1,587	1,196	-391	1,864	18.3
Maniema (Kindu)	1,470	1,220	-250	1,850	24.3
Haut-Katanga (Lubumbashi)	1,126	1,565	439	2,188	20.8
Lualaba (Kolwezi)	1,157	1,626	469	2,098	20.7
Haut-Lomami (Kamina)	1,207	1,528	321	2,036	22.5
Tanganyika (Kalemie)	1,118	1,697	579	2,060	24.9
Lomami (Kabinda)	1,347	1,561	214	1,952	24.7
Sankuru (Lusambo)	1,442	1,288	-154	1,944	25.4
Kasai-Oriental (Mbuji-Mayi)	1,322	1,521	199	2,010	25.4
Kasai (Tshikapa)	1,306	1,300	-6	1,998	25.1
Kasai-Central (Kananga)	1,378	1,330	-48	1,950	24.9

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

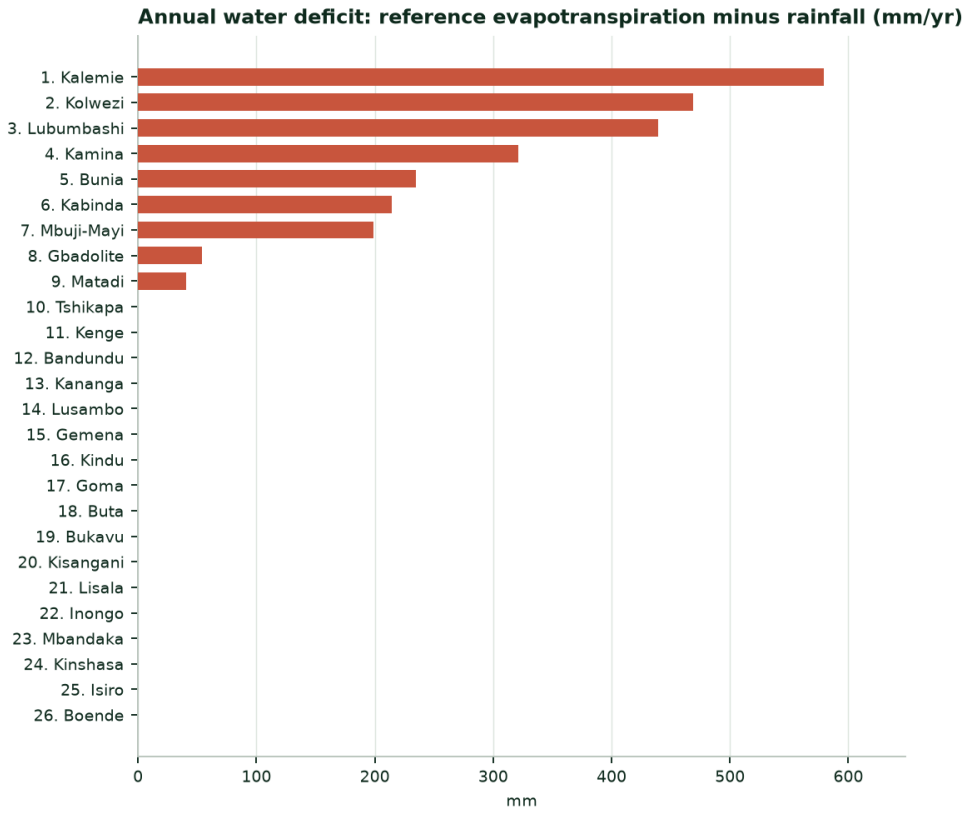


Figure 11. Annual water deficit: Reference evapotranspiration minus rainfall. Source: NASA POWER (A9)



The hills around Masi-Manimba (Kwilu).

7. The twenty main crops: Three rankings

7.1 By harvested area

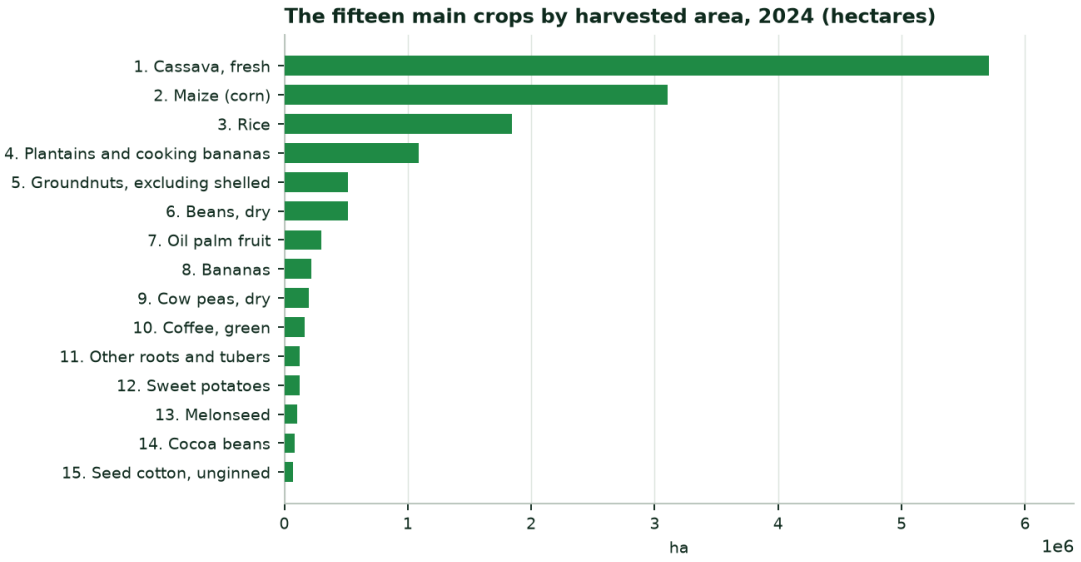


Figure 12. The fifteen main crops by harvested area, 2024 (hectares). Source: FAOSTAT (A2)

The ten main crops by area, 2024

Crop	Harvested area (ha)	Production (t)	Yield (t/ha)
Cassava, fresh	5,710,796	46,558,022	8.15

Crop	Harvested area (ha)	Production (t)	Yield (t/ha)
Maize (corn)	3,105,142	2,387,753	0.77
Rice	1,844,898	1,940,592	1.05
Plantains and cooking bananas	1,092,000	4,908,314	4.49
Groundnuts, excluding shelled	515,000	508,245	0.99
Beans, dry	513,001	280,241	0.55
Oil palm fruit	296,829	1,953,210	6.58
Bananas	215,911	811,021	3.76
Cow peas, dry	198,693	86,170	0.43
Coffee, green	166,516	65,701	0.39

Source: FAOSTAT (A2).

7.2 By production

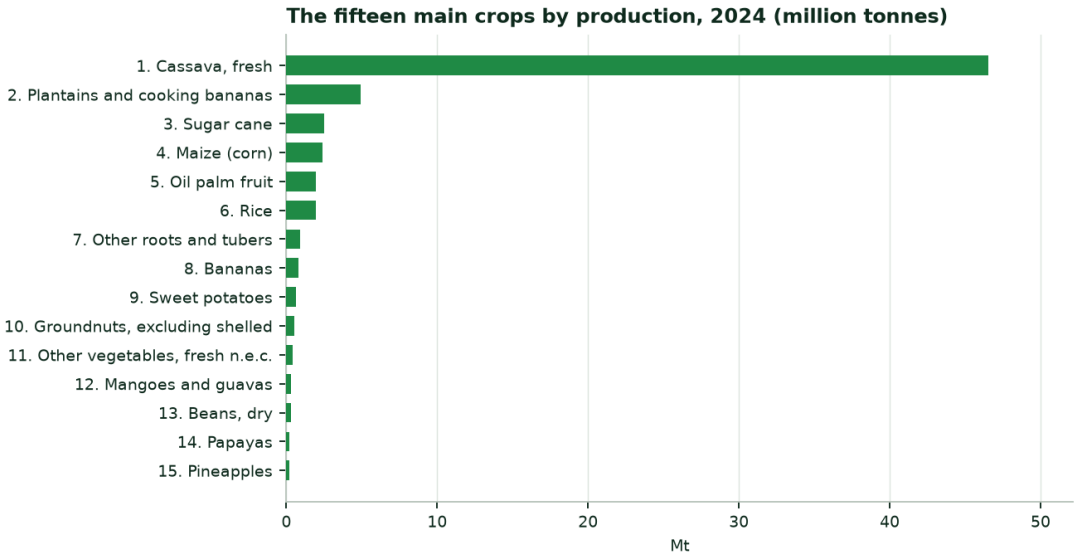


Figure 13. The fifteen main crops by production, 2024 (million tonnes). Source: FAOSTAT (A2)

7.3 By production value

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

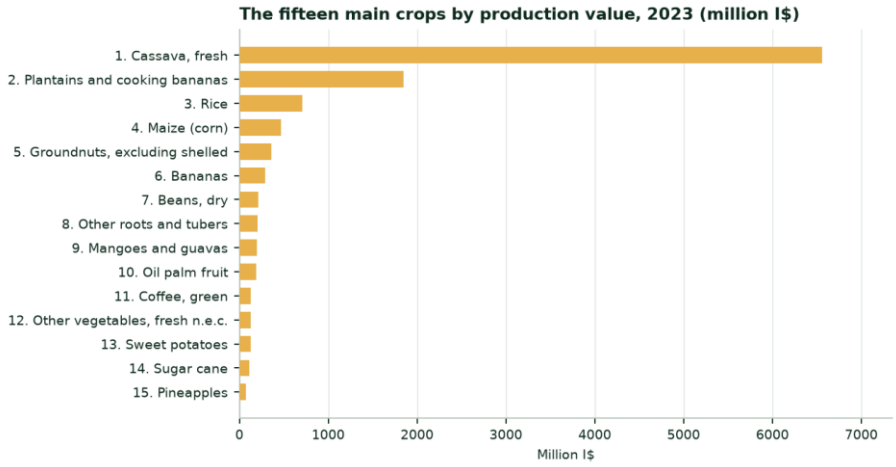


Figure 14. The fifteen main crops by production value, 2023 (million I$). Source: FAOSTAT (A3)



A rice field in the Democratic Republic of the Congo.

8. Extrapolation by crop: Irrigation and rainfed crops

8.1 Method

Method in brief

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

• **Rainfed crops.** For crops that have a trial (maize, soybean 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%	Soybean: Yield
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 Democratic 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, Soybean and Potato

Average 2024 yields (FAOSTAT): Maize 0.77 t/ha, soybean 0.56 t/ha and potato 4.57 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	0.77	329	657	1,315
Soybean	0.56	157	315	629
Potato	4.57	3,590	7,180	14,360

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

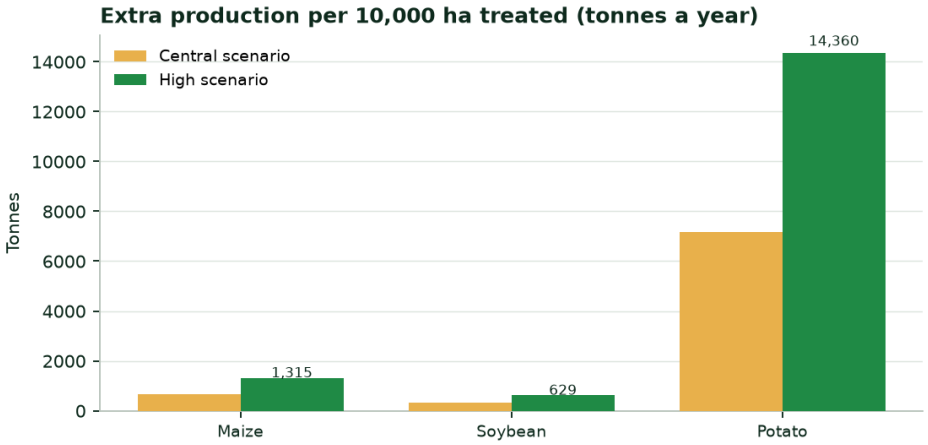


Figure 15. Extra production per 10,000 ha treated, central and high scenarios. Source: Author's calculation

8.4 Irrigation: Vegetables, Rice and Sugar cane

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, cabbage, others)	500	4.5%	Watermelon, Mexico (2023)	1.0
Rice	10,108	91.9%	Generic assumption, no trial	6.6
Sugar cane	392	3.6%	Generic assumption, no trial	0.3

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	3.9	601	246
Central	7.9	1,201	491
High	15.7	2,402	983

Source: Author's calculation (Annex B).

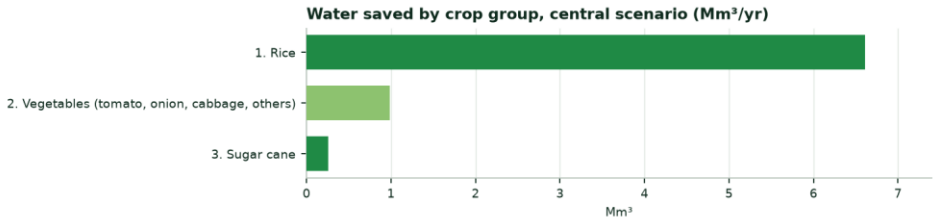


Figure 16. Water saved by crop group, central scenario. Source: Author's calculation

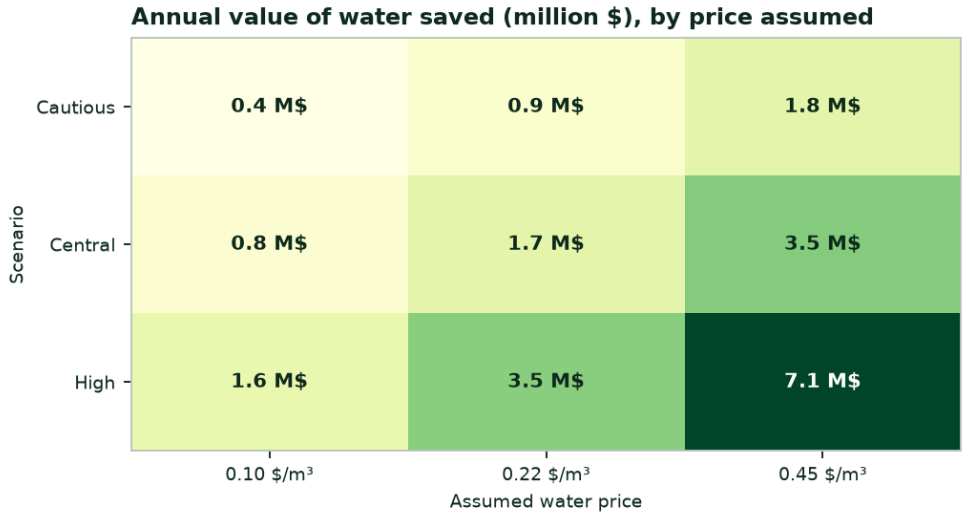


Figure 17. Annual value of the water saved, by price assumed per cubic metre. Source: Author's calculation; prices assumed, no national tariff

8.5 Reading the results

Key points

• In Democratic Republic of the Congo, the main challenge is rainfed farming: Only 11,000 ha are equipped for irrigation, for 18,509,470 ha of cropland.

• The "rice" group gives 84% of the irrigation water saving (generic assumption, no trial).

• 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 Democratic 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

Benefit	Published figures	Source (level)	Limit
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 Democratic Republic of the Congo

Source: Annex A.



Making palm oil at Lake Mukamba (Kasai-Central).

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)	192	359
Agricultural imports (crops and livestock)	1,094	1,289
Exports, all merchandise	16,400	30,000
Imports, all merchandise	11,600	26,500

Source: FAOSTAT (A4).

10.2 Exports

The three main farm products exported in 2024 are: Cocoa beans ($298 million), coffee, green ($25 million) and natural rubber in other forms ($10 million).

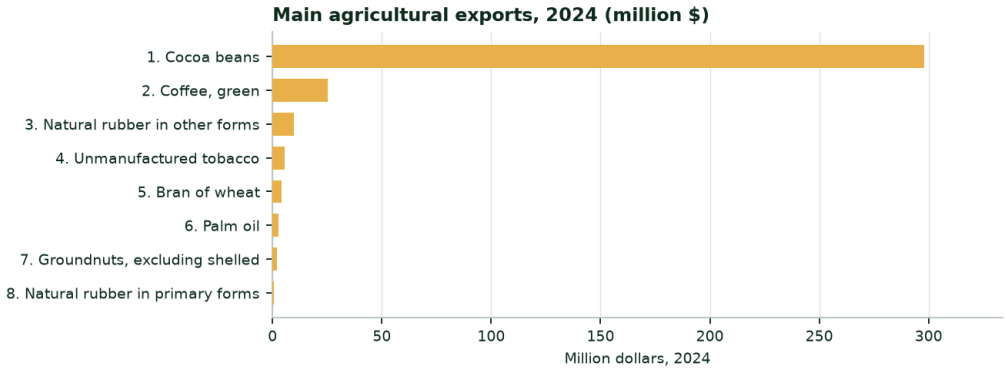


Figure 18. Main agricultural exports, 2024. Source: FAOSTAT (A4)

10.3 Imports

The main farm purchases are: Wheat ($117 million), cigarettes ($58 million) and flour-based food preparations ($56 million). Rice weighs $32 million (husked, broken and milled rice): Every tonne grown locally reduces this bill.

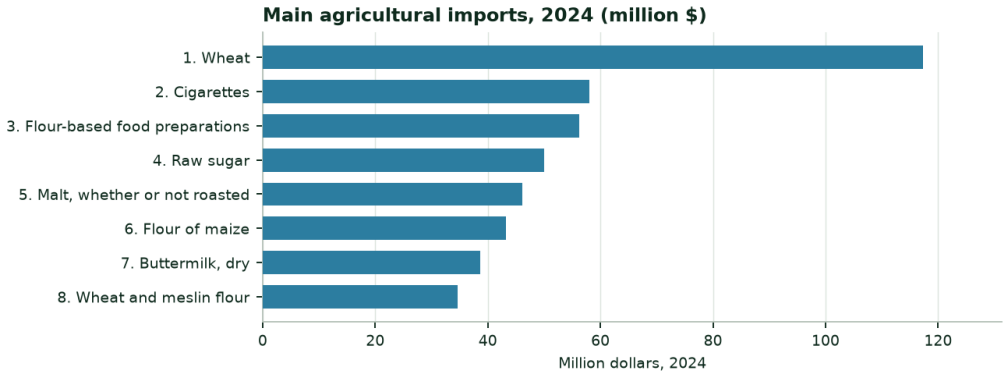


Figure 19. Main agricultural imports, 2024. Source: FAOSTAT (A4)



A farmers' market in Kinshasa.



The Tendeur market in Tshikapa (Kasai).

10.4 Importing water-retention polymers into Democratic Republic of the Congo

What to know

• **Customs duty (subheading 3906.90):** 5% under the MFN tariff applied by the Democratic Republic of the Congo, latest year published (2019) (A12).

• **VAT:** Standard rate of 16% (A12). Other import levies may apply; their amount is to be confirmed with a freight forwarder.

• **Exemption:** The 2011 agriculture law exempts imported agricultural inputs intended exclusively for farming from import duties and taxes, excluding administrative fees (Article 72, A13). Whether our products qualify is to be confirmed with the Ministry of Agriculture and Customs.

• **Placing on the market:** The same law provides for a national system for registering and controlling agricultural inputs before use, with rules set by decree (Article 30, A13).

• **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 Congo River from the air, near Kisangani.

Kinshasa (Kinshasa)

Kinshasa: Irrigated urban and peri-urban vegetable growing in the valleys, cassava on the sandy plateaus; the country's largest market.

Indicator	Value
Annual rainfall, 1991-2020	1,797 mm
Reference evapotranspiration	1,287 mm
Annual water deficit	-510 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,815 kWh/m²
Mean temperature	24.8 °C

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

Kongo Central (Matadi)

Kongo Central: Cassava, groundnut, beans, vegetables, fruit and sugar cane, close to the Kinshasa market.

Indicator	Value
Annual rainfall, 1991-2020	1,116 mm
Reference evapotranspiration	1,157 mm

Indicator	Value
Annual water deficit	41 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,821 kWh/m²
Mean temperature	25.3 °C

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

Kwango (Kenge)

Kwango: Cassava, groundnut and maize on sandy plateaus that hold water poorly.

Indicator	Value
Annual rainfall, 1991-2020	1,354 mm
Reference evapotranspiration	1,324 mm
Annual water deficit	-30 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,973 kWh/m²
Mean temperature	25.2 °C

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

Kwilu (Bandundu)

Kwilu: Cassava, maize, groundnut and oil palm; one of the breadbaskets of Kinshasa, with Kikwit.

Indicator	Value
Annual rainfall, 1991-2020	1,455 mm
Reference evapotranspiration	1,415 mm
Annual water deficit	-40 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,968 kWh/m²
Mean temperature	26.7 °C

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

Mai-Ndombe (Inongo)

Mai-Ndombe: Forest and Lake Mai-Ndombe; cassava, maize and fishing.

Indicator	Value
Annual rainfall, 1991-2020	1,682 mm
Reference evapotranspiration	1,252 mm
Annual water deficit	-430 mm
Months with less than 50 mm of rain	0
Global solar radiation	1,908 kWh/m²
Mean temperature	26.3 °C

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

Équateur (Mbandaka)

Équateur: Equatorial forest; cassava, upland rice, oil palm and fishing along the river.

Indicator	Value
Annual rainfall, 1991-2020	1,752 mm
Reference evapotranspiration	1,286 mm
Annual water deficit	-466 mm
Months with less than 50 mm of rain	0
Global solar radiation	1,885 kWh/m²
Mean temperature	26.2 °C

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

Sud-Ubangi (Gemena)

Sud-Ubangi: Maize, cassava, groundnut, coffee and oil palm, on densely populated land.

Indicator	Value
Annual rainfall, 1991-2020	1,614 mm
Reference evapotranspiration	1,383 mm
Annual water deficit	-231 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,965 kWh/m²
Mean temperature	25.6 °C

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

Nord-Ubangi (Gbadolite)

Nord-Ubangi: Cassava, maize, groundnut and coffee, between savannah and forest.

Indicator	Value
Annual rainfall, 1991-2020	1,452 mm
Reference evapotranspiration	1,506 mm
Annual water deficit	54 mm
Months with less than 50 mm of rain	3
Global solar radiation	2,002 kWh/m²
Mean temperature	25.8 °C

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

Mongala (Lisala)

Mongala: Upland rice, cassava, maize and oil palm along the Congo River.

Indicator	Value
Annual rainfall, 1991-2020	1,716 mm
Reference evapotranspiration	1,299 mm
Annual water deficit	-417 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,971 kWh/m²
Mean temperature	25.5 °C

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

Tshuapa (Boende)

Tshuapa: Dense forest; cassava, upland rice and oil palm, in a landlocked province.

Indicator	Value
Annual rainfall, 1991-2020	1,907 mm
Reference evapotranspiration	1,240 mm
Annual water deficit	-667 mm
Months with less than 50 mm of rain	0
Global solar radiation	1,889 kWh/m²
Mean temperature	25.1 °C

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

Tshopo (Kisangani)

Tshopo: Upland rice, cassava, plantain and oil palm around the large river port.

Indicator	Value
Annual rainfall, 1991-2020	1,644 mm
Reference evapotranspiration	1,249 mm
Annual water deficit	-395 mm
Months with less than 50 mm of rain	0
Global solar radiation	1,870 kWh/m²
Mean temperature	24.9 °C

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

Bas-Uele (Buta)

Bas-Uele: Cassava, rice, maize, groundnut and coffee, between forest and savannah.

Indicator	Value
Annual rainfall, 1991-2020	1,657 mm
Reference evapotranspiration	1,290 mm
Annual water deficit	-367 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,950 kWh/m²
Mean temperature	24.5 °C

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

Haut-Uele (Isiro)

Haut-Uele: Coffee, rice, cassava and groundnut in wooded savannah.

Indicator	Value
Annual rainfall, 1991-2020	1,938 mm
Reference evapotranspiration	1,304 mm
Annual water deficit	-634 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,962 kWh/m²
Mean temperature	23.2 °C

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

Ituri (Bunia)

Ituri: Beans, maize, cassava, bananas and coffee on the highlands, with livestock.

Indicator	Value
Annual rainfall, 1991-2020	1,187 mm
Reference evapotranspiration	1,422 mm
Annual water deficit	235 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,981 kWh/m²
Mean temperature	22.6 °C

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

North Kivu (Goma)

North Kivu: Fertile volcanic land; potato, beans, maize, vegetables, coffee and milk (Masisi).

Indicator	Value
Annual rainfall, 1991-2020	1,559 mm
Reference evapotranspiration	1,199 mm
Annual water deficit	-360 mm
Months with less than 50 mm of rain	1
Global solar radiation	1,846 kWh/m²
Mean temperature	17.5 °C

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

South Kivu (Bukavu)

South Kivu: Beans, cassava, bananas and arabica coffee; irrigated rice and sugar cane in the Ruzizi plain.

Indicator	Value
Annual rainfall, 1991-2020	1,587 mm
Reference evapotranspiration	1,196 mm
Annual water deficit	-391 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,864 kWh/m²
Mean temperature	18.3 °C

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

Maniema (Kindu)

Maniema: Upland rice, cassava, groundnut, maize and oil palm.

Indicator	Value
Annual rainfall, 1991-2020	1,470 mm
Reference evapotranspiration	1,220 mm
Annual water deficit	-250 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,850 kWh/m²
Mean temperature	24.3 °C

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

Haut-Katanga (Lubumbashi)

Haut-Katanga: Maize, the province's staple food, and vegetables, with a long dry season; commercial farms around the city.

Indicator	Value
Annual rainfall, 1991-2020	1,126 mm
Reference evapotranspiration	1,565 mm
Annual water deficit	439 mm
Months with less than 50 mm of rain	6
Global solar radiation	2,188 kWh/m²
Mean temperature	20.8 °C

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

Lualaba (Kolwezi)

Lualaba: Maize, cassava and vegetables for the mining towns, with a long dry season.

Indicator	Value
Annual rainfall, 1991-2020	1,157 mm
Reference evapotranspiration	1,626 mm
Annual water deficit	469 mm
Months with less than 50 mm of rain	5
Global solar radiation	2,098 kWh/m²
Mean temperature	20.7 °C

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

Haut-Lomami (Kamina)

Haut-Lomami: Maize, cassava, groundnut and rice, in savannah.

Indicator	Value
Annual rainfall, 1991-2020	1,207 mm
Reference evapotranspiration	1,528 mm
Annual water deficit	321 mm
Months with less than 50 mm of rain	5
Global solar radiation	2,036 kWh/m²
Mean temperature	22.5 °C

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

Tanganyika (Kalemie)

Tanganyika: Maize, cassava, rice and oil palm; fishing on Lake Tanganyika.

Indicator	Value
Annual rainfall, 1991-2020	1,118 mm
Reference evapotranspiration	1,697 mm
Annual water deficit	579 mm
Months with less than 50 mm of rain	5
Global solar radiation	2,060 kWh/m²
Mean temperature	24.9 °C

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

Lomami (Kabinda)

Lomami: Maize, cassava, groundnut and beans in savannah.

Indicator	Value
Annual rainfall, 1991-2020	1,347 mm
Reference evapotranspiration	1,561 mm
Annual water deficit	214 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,952 kWh/m²
Mean temperature	24.7 °C

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

Sankuru (Lusambo)

Sankuru: Cassava, maize, rice and groundnut, between forest and savannah.

Indicator	Value
Annual rainfall, 1991-2020	1,442 mm
Reference evapotranspiration	1,288 mm
Annual water deficit	-154 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,944 kWh/m²
Mean temperature	25.4 °C

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

Kasai-Oriental (Mbuji-Mayi)

Kasai-Oriental: Maize and cassava; a large city that depends on food from neighbouring provinces.

Indicator	Value
Annual rainfall, 1991-2020	1,322 mm
Reference evapotranspiration	1,521 mm
Annual water deficit	199 mm
Months with less than 50 mm of rain	4
Global solar radiation	2,010 kWh/m²
Mean temperature	25.4 °C

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

Kasai (Tshikapa)

Kasai: Cassava, maize, groundnut and beans, in savannah and gallery forest.

Indicator	Value
Annual rainfall, 1991-2020	1,306 mm
Reference evapotranspiration	1,300 mm
Annual water deficit	-6 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,998 kWh/m²
Mean temperature	25.1 °C

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

Kasai-Central (Kananga)

Kasai-Central: Maize, cassava, groundnut and beans on the plateau savannahs.

Indicator	Value
Annual rainfall, 1991-2020	1,378 mm
Reference evapotranspiration	1,330 mm
Annual water deficit	-48 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,950 kWh/m²
Mean temperature	24.9 °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), Democratic 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, Democratic Republic of the Congo: 10,500 ha equipped (1995), 6,800 ha actually irrigated (2000), irrigation drawn entirely from surface water	A
A12	World Bank, WITS (UNCTAD TRAINS database), Democratic Republic of the Congo, applied MFN duties, subheading 3906.90, 2019; PwC, Worldwide Tax Summaries, Democratic Republic of the Congo: Standard VAT rate	A
A13	Law No. 11/022 of 24 December 2011 on the fundamental principles of agriculture, Articles 30 (registration and control of agricultural inputs) and 72 (exemption of imported agricultural inputs)	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 (684 Mm³, 2022) × agricultural share (10.52%) = 71.9 Mm³.

2. Irrigation. The equipped area (11,000 ha) and agricultural water are shared between irrigated groups (vegetables, rice and sugar cane) in proportion to their harvested areas (2,007,740 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, rice, sugar cane): It is shared among them pro rata, and the rest of their area is rainfed. Maize, soybean 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 (6,536 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%, soybean 11.3% 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 province.

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

File (Wikimedia Commons)	Author	Licence
Wealth of the Masisi.jpg	Julien Harneis	CC BY-SA 2.0
Une famille congolaise cultivant les champs dans les environs de Kalem	MONUSCO Photos	CC BY-SA 2.0
A Pineapple Farmer in Congo (DRC).jpg	Muhammad Wasi	CC BY-SA 4.0
Lake Kivu Congo Side.jpg	Fanny Schertzer	CC BY 3.0
Pirogues on the Congo River -a.jpg	Julien Harneis from Conakry, Guinea	CC BY-SA 2.0
Disease-Resistant Cassava Revives DRC Agriculture.JPG	Alain Mukeba, USAID	Public domain
View from the rural town of Masi Manimba, DRC (7609936324).jpg	DFID - UK Department for International Develop	CC BY-SA 2.0
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Palm oil manufacture (2) Lac Mukamba, Deretoire de Dimbelenge, Kasai o	Thomas Erwin von Arx	CC BY-SA 4.0
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Women returning from their gardens Basankusu.jpg	Francis Hannaway	CC BY-SA 3.0

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Back from the gardens in Basankusu (Équateur).

Green Solutions

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