COUNTRY DOSSIER

Côte d'Ivoire

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

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Pineapple fields at Bonoua, in the south-east of the country.

Foreword

This dossier describes Côte d'Ivoire 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? 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, ECOWAS, WAEMU, Ivorian administration).
- **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 Côte d'Ivoire.

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Summary

The points below summarise the dossier. The figures come from public sources: The World Bank, FAO (FAOSTAT, AQUASTAT), ECOWAS, WAEMU, Ivorian administration, PVGIS and ERA5. The production gains and water savings are scenarios, described in Annex B.

32.71 M
Inhabitants in 2025 (World Bank)

3.81 M ha
Of cocoa beans harvested in 2024, the main crop

72,750 ha
Equipped for irrigation (2024)

+2,192 t
Of maize per 10,000 ha treated, central scenario

75.5 Mm³
Of irrigation water saved a year, central scenario

12,372 M$
Of agricultural exports in 2024 (FAOSTAT)

Key points

• **Predominantly rainfed farming.** 72,750 ha equipped for irrigation in 2024, out of 13.47 million hectares of cropland: Almost every harvest depends on rain.

• **Cocoa beans: The main crop.** 3,814,984 ha harvested in 2024, for 1.89 million tonnes, or 0.50 t/ha.

• **Water is not scarce over the year as a whole; it is scarce between rainfall events.** National water stress is only 5.1%, but at Korhogo, atmospheric water demand exceeds rainfall by 703 mm.

• **In rainfed farming, the gain is counted in tonnes.** In the central scenario, an additional 2,192 t of maize per 10,000 ha treated.

• **In irrigated farming, the water saved could allow irrigation schemes to be expanded.** 75.5 Mm³ a year in the central scenario, enough to irrigate about 9,150 more ha, or 12.6% of the equipped area.

• **An organic supply chain.** 93,070 ha of certified organic cropland in 2024: ECOFERT® is EU Bio certified.

• **All nitrogen is imported.** 57,300 t of nitrogen used in 2024, 117,582 t imported, no national production.

• **Farm trade.** $12,372 million of exports and $2,651 million of imports in 2024. Leading export: Cocoa beans ($3,994 million). Rice imports amount to $1,005 million.

Key figures

Key indicators for Côte d'Ivoire

Indicator	Value	Year	Source (level)
Population	32.71 M	2025	World Bank (A1)
GDP per capita	3,050 $	2025	World Bank (A1)
Agriculture's share of GDP	16.8%	2025	World Bank (A1)
Agricultural employment	45.4%	2025	World Bank (A1)
Cropland	13,468,410 ha	2024	FAOSTAT (A6)
Area equipped for irrigation	72,750 ha	2024	FAOSTAT (A6)
Harvested area: Cocoa beans	3,814,984 ha	2024	FAOSTAT (A2)
Certified organic cropland	93,070 ha	2024	FAOSTAT (A6)
Agricultural exports	12,372 M$	2024	FAOSTAT (A4)
Agricultural imports	2,651 M$	2024	FAOSTAT (A4)

Indicator	Value	Year	Source (level)
Mineral nitrogen, agricultural use	57,300 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 reported in 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 Côte d'Ivoire. 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 farmer in his cassava field.

2. Côte d'Ivoire in figures

Côte d'Ivoire had 32.71 million inhabitants in 2025, 45% of them in rural areas. Agriculture accounts for 16.8% of gross domestic product and employs 45% of the labour force. The country covers 318.0 thousand km², of which 84% is agricultural land. Undernourishment affects 11.4% of the population.

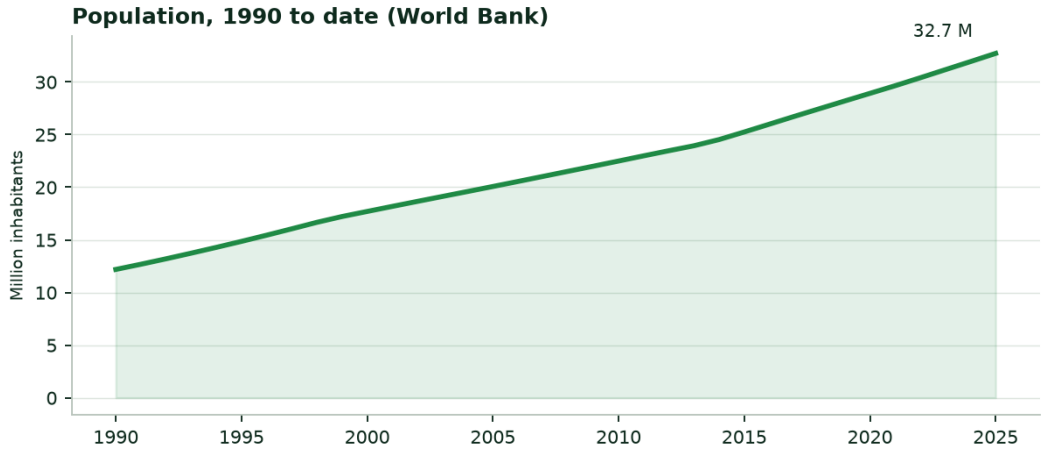


Figure 1. Population of Côte d'Ivoire, 1990 to date. Source: World Bank (A1)

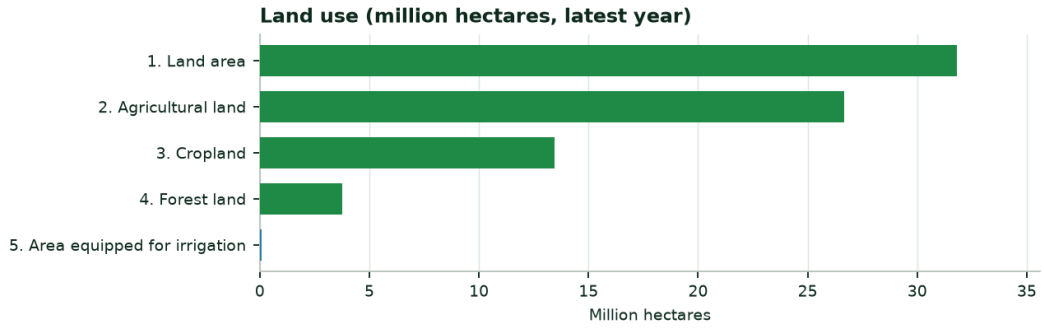


Figure 2. Land use, latest year published. Source: FAOSTAT (A6)

Agricultural and water indicators, latest year published

Indicator	Value	Year	Source
Cropland certified organic	93,070 ha	2024	FAOSTAT (A6)
Average cereal yield	2,542 kg/ha	2024	World Bank (A1)
Fertiliser use per hectare of arable land	28.4 kg/ha	2024	World Bank (A1)
Water withdrawals, agricultural share	51.6%	2022	World Bank (A1)
Internal freshwater resources	76.8 km³	2022	World Bank (A1)
Internal resources per inhabitant	2,528 m³	2022	World Bank (A1)



Market gardens in the city of Bouaké.

3. Sunshine, rainfall and climate change

3.1 Sunshine

Global solar radiation reaches 1,864 to 2,184 kWh/m² a year depending on the region. Energy is not the limiting factor: Water available at the right time determines the harvest.

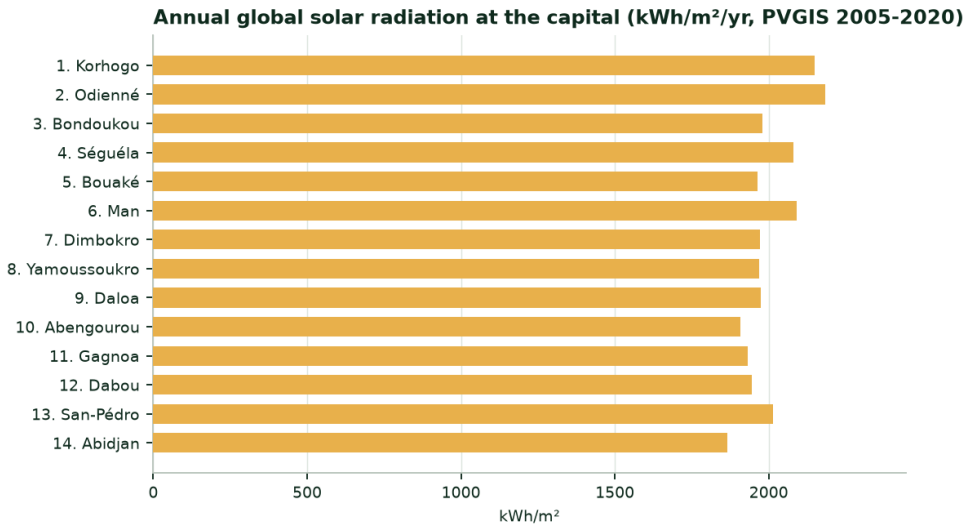


Figure 3. Annual global solar radiation at each region's capital. Source: PVGIS (A8)

3.2 Rainfall and evapotranspiration

Annual rainfall is 1,890 mm at Dabou, but only 929 mm at Dimbokro, where reference evapotranspiration reaches 1,366 mm. In the south, rain falls in two seasons, from April to July and then from October to November; in the north, in a single season from May to October, followed by a dry season marked by the harmattan.

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

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Korhogo	6	12	36	72	101	109	183	247	188	84	16	2
Odienné	6	9	35	83	124	167	241	291	233	120	25	3
Bondoukou	12	31	87	110	112	108	119	141	182	130	48	14
Séguéla	18	42	101	122	143	143	159	205	229	153	66	16
Bouaké	19	46	95	119	124	142	147	181	221	141	52	14
Man	25	58	118	122	152	169	181	215	245	147	59	21
Dimbokro	16	42	83	99	104	113	86	99	137	92	42	16
Yamoussoukro	20	50	94	113	110	116	90	114	158	115	55	17
Daloa	20	46	93	102	120	124	113	149	195	130	53	19
Abengourou	19	46	88	97	116	120	98	91	131	112	55	20
Gagnoa	25	55	94	104	129	135	89	110	171	144	69	28
Dabou	83	102	143	150	245	268	152	92	162	207	171	115
San-Pédro	51	57	74	88	201	275	140	83	127	119	102	72
Abidjan	86	107	150	157	238	253	146	85	151	199	165	115

Source: ERA5 via Open-Meteo (A9); author's calculation.

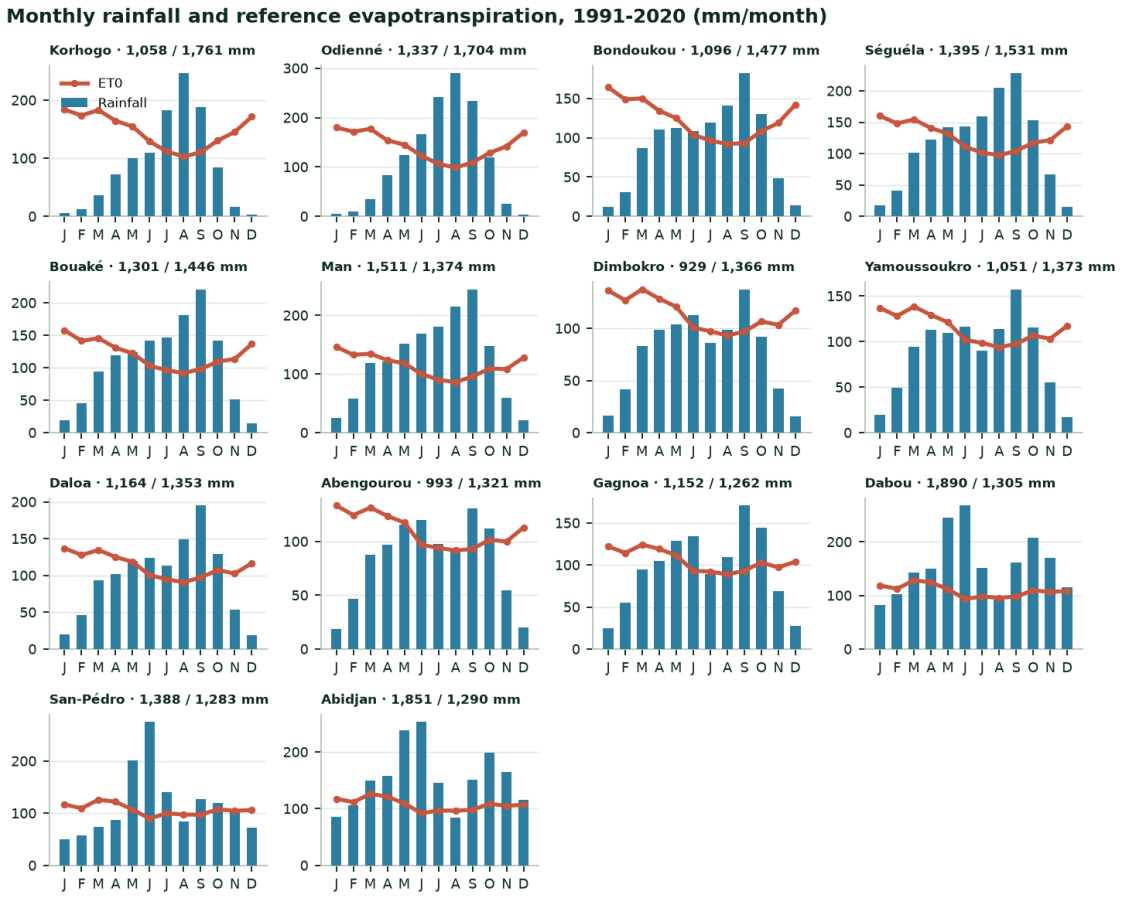


Figure 4. Monthly rainfall and reference evapotranspiration by city, 1991-2020. Source: ERA5 via Open-Meteo (A9)

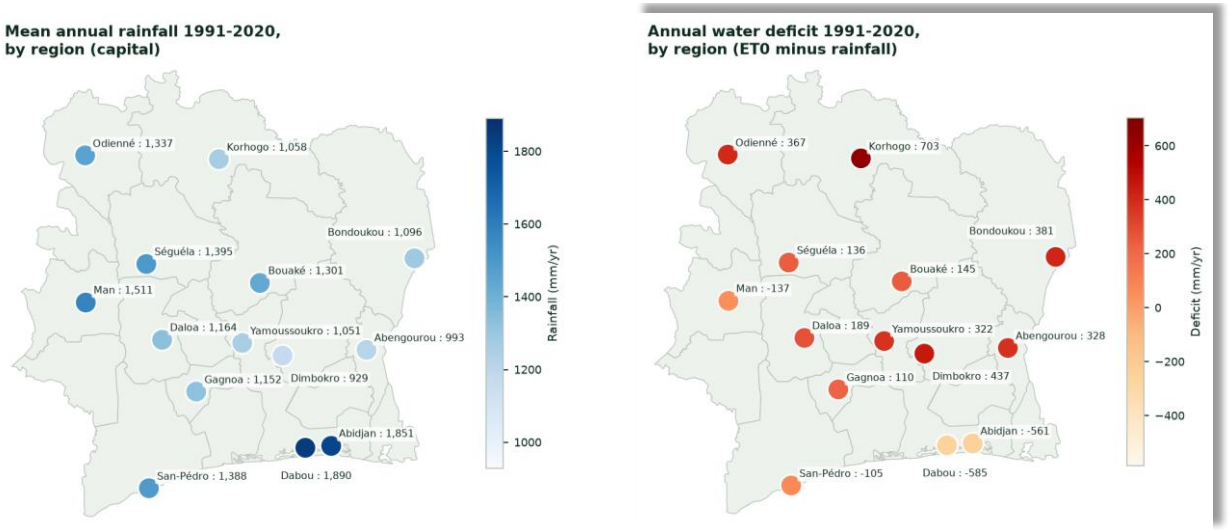


Figure 5. Mean annual rainfall 1991-2020, by region. Source: ERA5 (A9), Natural Earth (A10). Annual water deficit, by region. Source: ERA5 (A9), Natural Earth (A10).

3.3 Climate change

Mean annual temperature is rising. At Korhogo it went from 25.9 °C in 1981 to 27.3 °C in 2024, a trend of 0.17 °C per decade. At Abidjan the trend is 0.14 °C per decade, from 25.2 °C to 26.2 °C. Warmer air dries the soil faster between rainfall events.

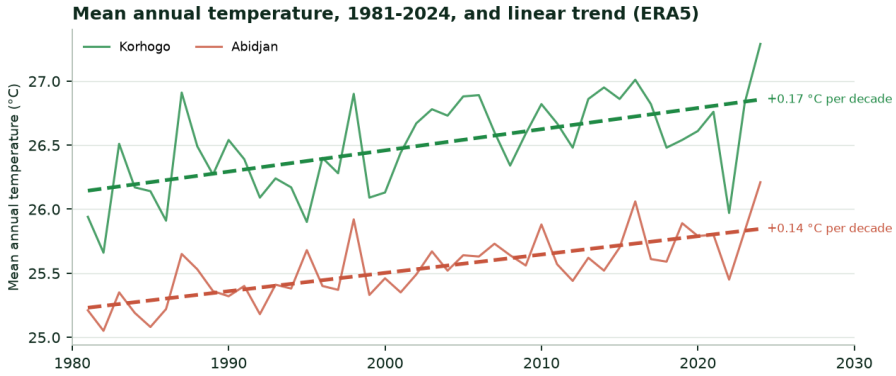


Figure 6. Mean annual temperature, 1981-2024, and linear trend. Source: ERA5 (A9)



Landscape of Comoé National Park, in the north-east.

4. Water: Resources, irrigated areas, withdrawals

4.1 Resources and withdrawals

Total freshwater withdrawals are 1,162 million m³ a year (2022). Agriculture accounts for 51.6% of these withdrawals, that is 600 Mm³. Internal resources are 76.8 km³ a year and water stress is 5.1%: The country has water, but little of it is mobilised for crops.

Freshwater: Withdrawals and resources

Indicator	Value	Year	Source
Total withdrawals	1,162 Mm³	2022	World Bank (A1)
Agricultural share	51.6%	2022	World Bank (A1)
Agricultural withdrawals	600.0 Mm³	2022	Calculated from A1
Area equipped for irrigation	72,750 ha	2024	FAOSTAT (A6)
Agricultural withdrawals per equipped hectare	8,247 m³/ha	—	Calculation (Annex B)
Water stress	5.1%	2022	World Bank (A1)

4.2 Irrigated areas

FAOSTAT counts 72,750 hectares equipped for irrigation in 2024. FAO estimates the country's irrigation potential at 475,000 ha (A11). Irrigation mostly serves rice in lowlands and developed schemes, sugar cane in the sugar complexes, export bananas and market gardening.



A multiple-harvest rice trial, in the centre of the country.

4.3 What the water saving represents

In the central scenario, the saving is 75.5 million m³ a year, or 12.6% of agricultural withdrawals. At 8,247 m³ per equipped hectare, this water would irrigate about 9,150 more hectares, or 12.6% of today's equipped area.

5. Fertilisers: Quantities, purchases, spending

5.1 Quantities used

In 2024, agricultural use reaches 57,300 tonnes of nitrogen, 5,110 tonnes of phosphate (P2O5) and 79,000 tonnes of potash (K2O). The country produces no nitrogen fertiliser: It imported 117,582 tonnes of nitrogen in the same year. Per hectare of arable land, use is 28.4 kg per hectare.

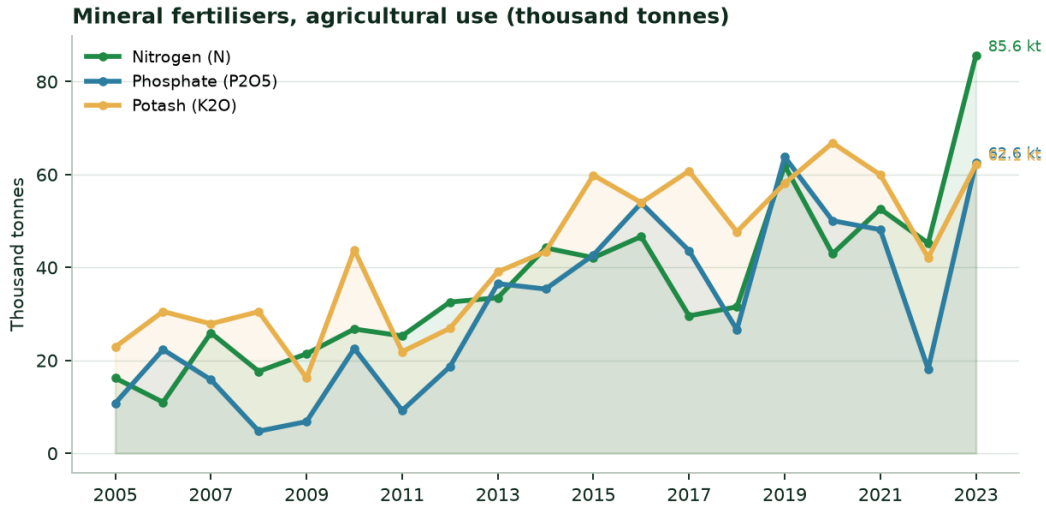


Figure 7. Mineral fertilisers, agricultural use, 2005-2023. Source: FAOSTAT (A5)

5.2 Regulatory framework

ECOWAS Regulation C/REG.13/12/12 governs fertiliser quality control in the West African area: Registration before sale, labelling, control (A13).



Lettuce harvest.

5.3 Indicative spending

In 2024, the indicative minimum spending on mineral fertilisers reaches $86 million, at international fertiliser prices (calculation in Annex B, lower bound).

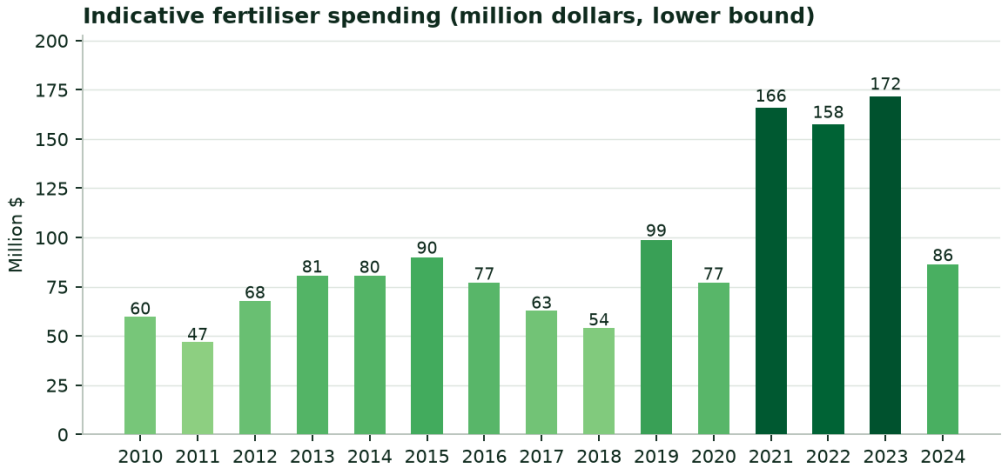


Figure 8. Indicative fertiliser spending, lower bound. Source: Author's calculation from A5 and A7

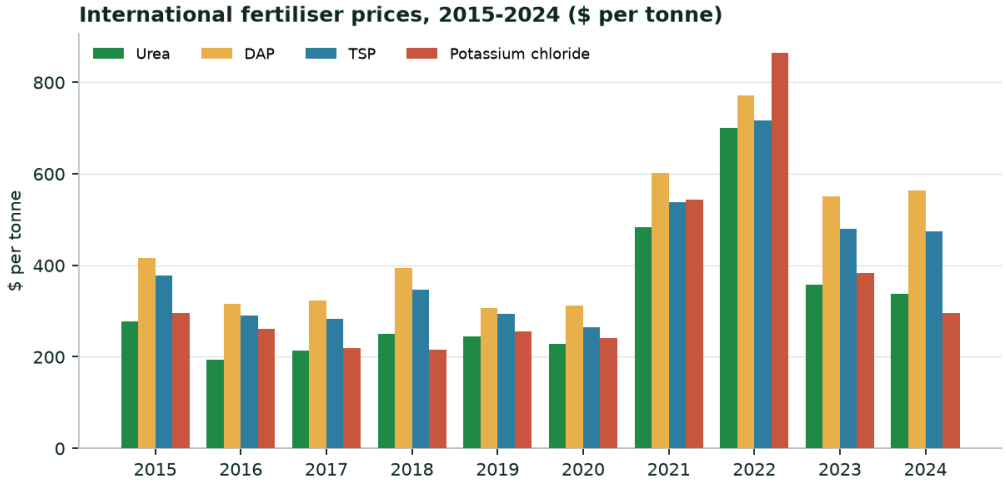


Figure 9. International prices of urea, DAP, TSP and potassium chloride. Source: World Bank, Pink Sheet (A7)

6. The regions at a glance

The table compares the country's fourteen districts, including the two autonomous districts of Abidjan and Yamoussoukro, using each region's 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)
Savanes (Korhogo)	1,058	1,761	703	2,149	26.6
Denguélé (Odienné)	1,337	1,704	367	2,184	26.2
Zanzan (Bondoukou)	1,096	1,477	381	1,979	25.7
Woroba (Séguéla)	1,395	1,531	136	2,081	26.0
Vallée du Bandama (Bouaké)	1,301	1,446	145	1,964	25.8
Montagnes (Man)	1,511	1,374	-137	2,092	25.3
Lacs (Dimbokro)	929	1,366	437	1,972	26.5
Yamoussoukro (autonomous district) (Yamoussoukro)	1,051	1,373	322	1,969	26.0
Sassandra-Marahoué (Daloa)	1,164	1,353	189	1,973	25.5

Region (city)	Rainfall (mm/yr)	ET0 (mm/yr)	Deficit (mm/yr)	Radiation (kWh/m²/yr)	Temperature (°C)
Comoé (Abengourou)	993	1,321	328	1,909	25.9
Gôh-Djiboua (Gagnoa)	1,152	1,262	110	1,932	25.2
Lagunes (Dabou)	1,890	1,305	-585	1,944	25.9
Bas-Sassandra (San-Pédro)	1,388	1,283	-105	2,013	25.7
Abidjan (autonomous district) (Abidjan)	1,851	1,290	-561	1,864	25.6

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

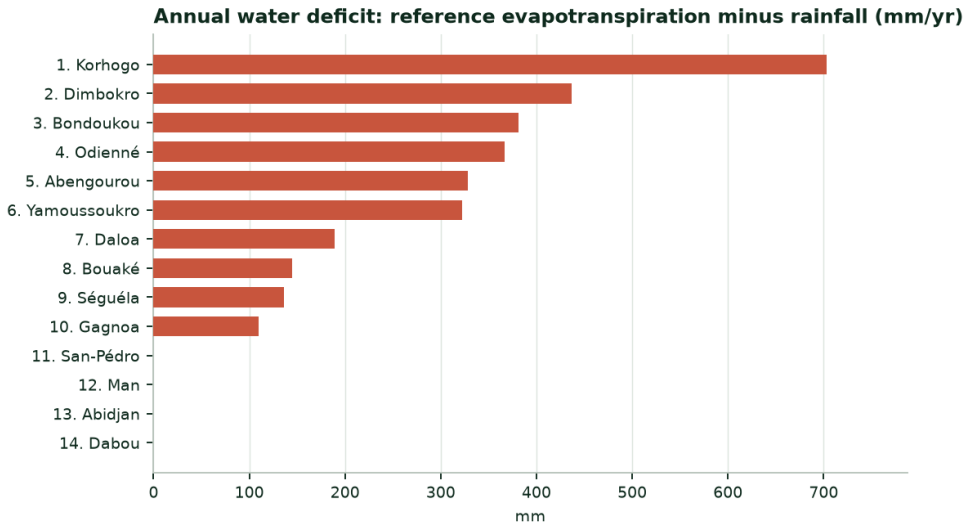


Figure 10. Annual water deficit: Reference evapotranspiration minus rainfall. Source: ERA5 (A9)



Back from the fields, under oil palms.

7. The twenty main crops: Three rankings

7.1 By harvested area

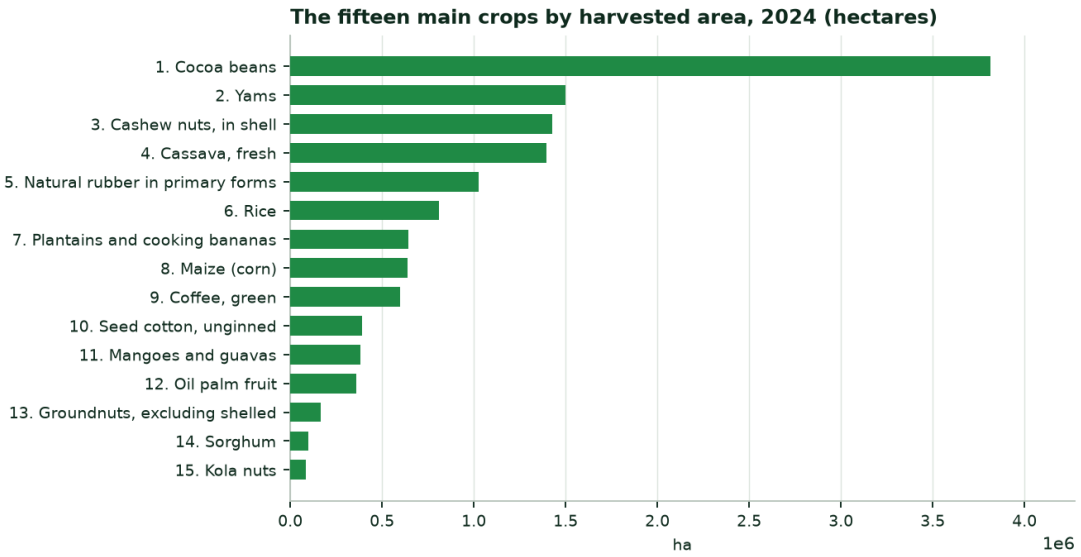


Figure 11. The fifteen main crops by harvested area, 2024 (hectares). Source: FAOSTAT (A2)

The ten main crops by area, 2024

Crop	Harvested area (ha)	Production (t)	Yield (t/ha)
Cocoa beans	3,814,984	1,890,442	0.50
Yams	1,498,407	7,660,870	5.11
Cashew nuts, in shell	1,428,211	944,673	0.66
Cassava, fresh	1,394,159	8,485,694	6.09
Natural rubber in primary forms	1,027,211	1,686,599	1.64
Rice	811,177	2,381,129	2.94
Plantains and cooking bananas	641,598	2,465,235	3.84
Maize (corn)	640,000	1,640,661	2.56
Coffee, green	599,673	72,133	0.12
Seed cotton, unginned	392,696	347,922	0.89

Source: FAOSTAT (A2).

7.2 By production

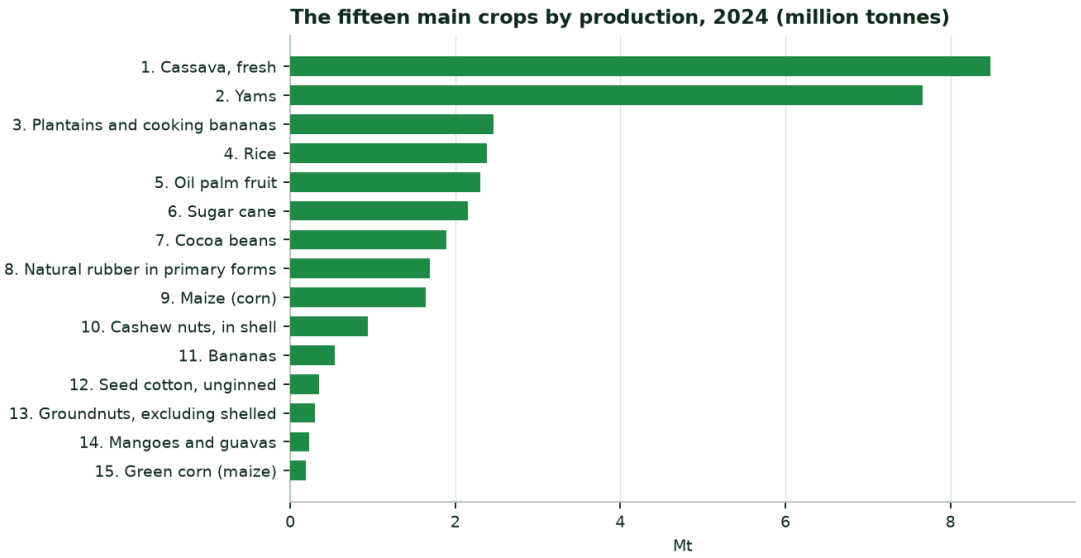


Figure 12. The fifteen main crops by production, 2024 (million tonnes). Source: FAOSTAT (A2)

7.3 By production value

By production value, the three main crops are: Cocoa beans, natural rubber in primary forms and yams (FAOSTAT, 2023, constant international dollars).

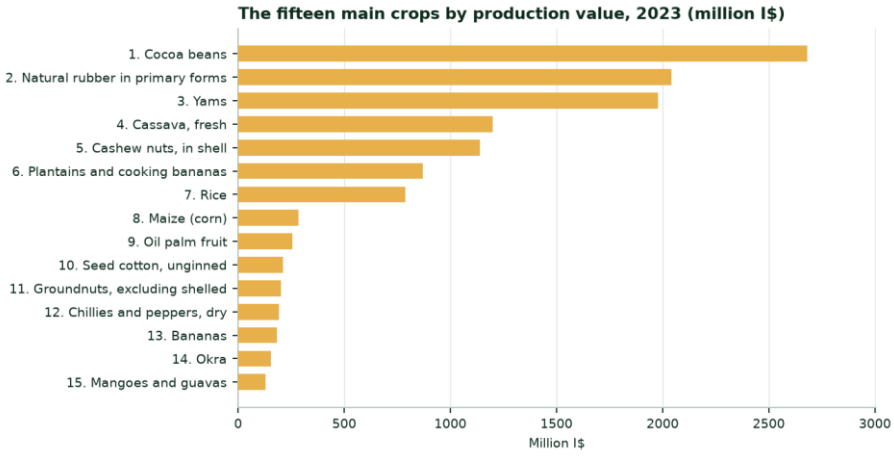


Figure 13. The fifteen main crops by production value, 2023 (million I$). Source: FAOSTAT (A3)



Cocoa pods at Tiassalé.

8. Extrapolation by crop: Irrigation and rainfed crops

8.1 Method

Method in brief

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

• **Rainfed crops.** For crops that have a trial (maize), 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%	Not used; cited for reference
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 Côte d'Ivoire: The figures below apply the results of the cited trials to the country's average yields.

8.3 Rainfed crops: Maize

Average 2024 yields (FAOSTAT): Maize 2.56 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	2.56	1,096	2,192	4,384

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

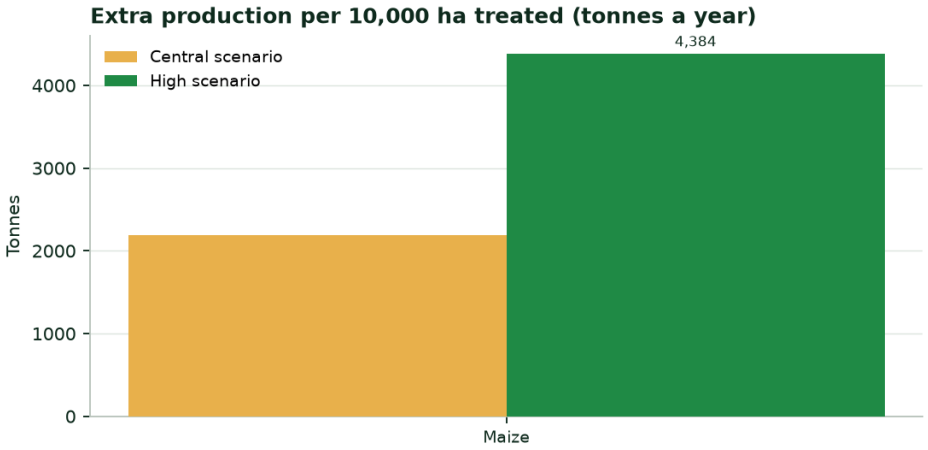


Figure 14. Extra production per 10,000 ha treated, central and high scenarios. Source: Author's calculation

8.4 Irrigation: Rice, Vegetables and Sugar cane and dessert banana

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

Crop group	Equipped area (ha)	Share	Trial or assumption	Water saved (Mm³/yr)
Rice (paddy)	60,600	83.3%	Generic assumption, no trial on rice	50.0
Vegetables (okra, eggplant, chilli, tomato, others)	9,259	12.7%	Watermelon, Mexico (2023)	23.1
Sugar cane and dessert banana	2,892	4.0%	Generic assumption, no trial	2.4

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	37.7	4,575	3,281
Central	75.5	9,150	6,561
High	150.9	18,300	13,123

Source: Author's calculation (Annex B).

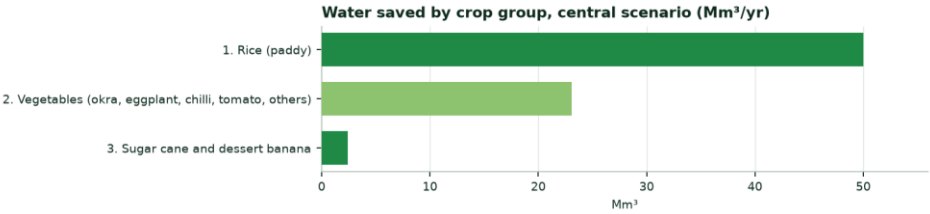


Figure 15. Water saved by crop group, central scenario. Source: Author's calculation

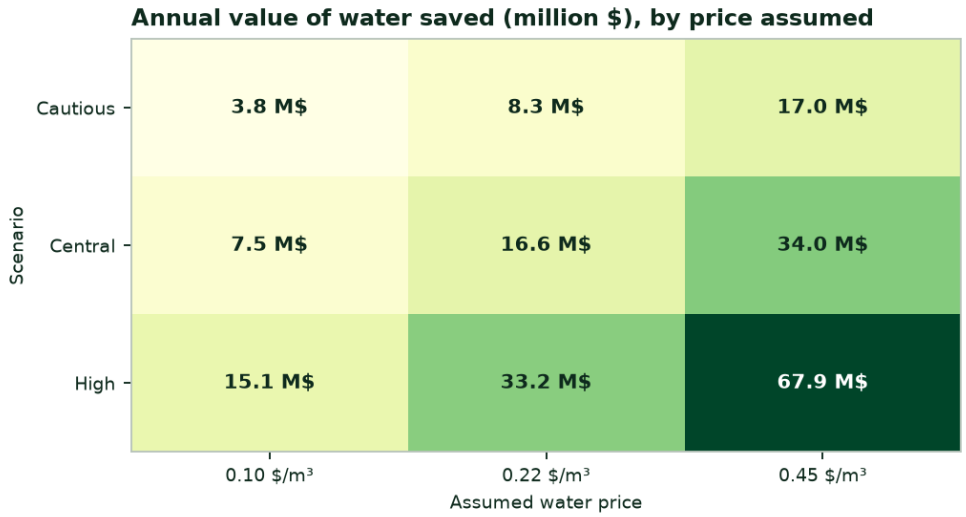


Figure 16. Annual value of the water saved, by price assumed per cubic metre. Source: Author's calculation; prices assumed, no national tariff

8.5 Reading the results

Key points

• In Côte d'Ivoire, the main challenge is rainfed farming: Only 72,750 ha are equipped for irrigation, out of 13,468,410 ha of cropland.

• The "rice" group gives 66% of the irrigation water saving (generic assumption, no trial on rice).

• 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 Côte d'Ivoire
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 Côte d'Ivoire

Source: Annex A.



Market gardens and lettuce harvest.

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)	10,376	12,372
Agricultural imports (crops and livestock)	2,385	2,651
Exports, all merchandise	20,263	21,016
Imports, all merchandise	18,887	19,397

Source: FAOSTAT (A4).

10.2 Exports

The three main farm products exported in 2024 are: Cocoa beans ($3,994 million), natural rubber in other forms ($2,353 million) and cocoa paste not defatted ($1,232 million).

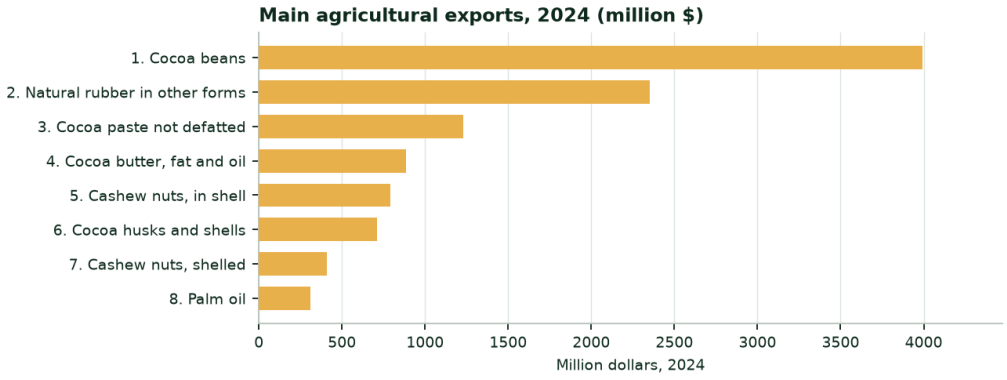


Figure 17. Main agricultural exports, 2024. Source: FAOSTAT (A4)

10.3 Imports

The main farm purchases are: Wheat ($223 million), unmanufactured tobacco ($119 million) and soya bean cake ($105 million). Rice imports amount to $1,005 million (husked, broken and milled rice): Every tonne grown locally reduces this bill.

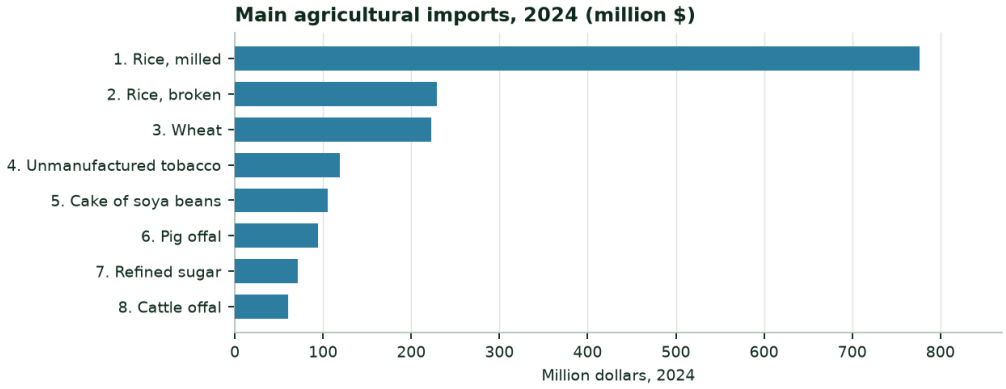


Figure 18. Main agricultural imports, 2024. Source: FAOSTAT (A4)



Figure 19. Cocoa pods harvested at Soubré, in the west of the country.



A food market on the Abidjan-Abengourou road.

10.4 Importing water-retention polymers into Côte d'Ivoire

What to know

- **Customs duty (code 3906.90.00.00, acrylic polymers in primary forms):** 5% under the ECOWAS common external tariff (A12).
- **Levies:** 1% statistical fee, 1% WAEMU community solidarity levy and 0.5% ECOWAS community levy (A12).
- **VAT:** 18% (A12).
- **Registration:** A fertiliser must be registered before sale, under ECOWAS Regulation C/REG.13/12/12 (A13).
- **Classification:** Code 3906.90 is an inference for our products; Ivorian customs settle 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.



Palms and banana plants in a field in the centre of the country.

Savanes (Korhogo)

Cotton, cashew, mango, lowland rice, maize and yam; a single rainy season, then the harmattan.

Indicator	Value
Annual rainfall, 1991-2020	1,058 mm
Reference evapotranspiration	1,761 mm
Annual water deficit	703 mm
Months with less than 50 mm of rain	5
Global solar radiation	2,149 kWh/m²
Mean temperature	26.6 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Denguélé (Odienné)

The dry north-west: Cashew, cotton, rice and livestock.

Indicator	Value
Annual rainfall, 1991-2020	1,337 mm
Reference evapotranspiration	1,704 mm
Annual water deficit	367 mm
Months with less than 50 mm of rain	5
Global solar radiation	2,184 kWh/m²
Mean temperature	26.2 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Zanzan (Bondoukou)

North-east: Cashew, yam and maize, near Comoé National Park.

Indicator	Value
Annual rainfall, 1991-2020	1,096 mm
Reference evapotranspiration	1,477 mm
Annual water deficit	381 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,979 kWh/m²
Mean temperature	25.7 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Woroba (Séguéla)

Transition between forest and savanna: Cashew, cotton, yam and groundnuts.

Indicator	Value
Annual rainfall, 1991-2020	1,395 mm
Reference evapotranspiration	1,531 mm
Annual water deficit	136 mm
Months with less than 50 mm of rain	3
Global solar radiation	2,081 kWh/m²
Mean temperature	26.0 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Vallée du Bandama (Bouaké)

The centre of the country: Yam, cashew, maize, cotton and market gardening; a hub of the food trade.

Indicator	Value
Annual rainfall, 1991-2020	1,301 mm
Reference evapotranspiration	1,446 mm
Annual water deficit	145 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,964 kWh/m²
Mean temperature	25.8 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Montagnes (Man)

Western uplands: Coffee, cocoa, upland rice and rubber, under heavy rainfall.

Indicator	Value
Annual rainfall, 1991-2020	1,511 mm
Reference evapotranspiration	1,374 mm
Annual water deficit	-137 mm
Months with less than 50 mm of rain	2
Global solar radiation	2,092 kWh/m²
Mean temperature	25.3 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Lacs (Dimbokro)

The former cocoa loop: Yam, cassava, cashew and cocoa.

Indicator	Value
Annual rainfall, 1991-2020	929 mm
Reference evapotranspiration	1,366 mm
Annual water deficit	437 mm
Months with less than 50 mm of rain	4
Global solar radiation	1,972 kWh/m²
Mean temperature	26.5 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Yamoussoukro (autonomous district) (Yamoussoukro)

The political capital: Yam, cassava, maize and market gardening.

Indicator	Value
Annual rainfall, 1991-2020	1,051 mm
Reference evapotranspiration	1,373 mm
Annual water deficit	322 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,969 kWh/m²
Mean temperature	26.0 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Sassandra-Marahoué (Daloa)

A large cocoa and coffee basin, with rice, plantain and rubber.

Indicator	Value
Annual rainfall, 1991-2020	1,164 mm
Reference evapotranspiration	1,353 mm
Annual water deficit	189 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,973 kWh/m²
Mean temperature	25.5 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Comoé (Abengourou)

The forested east: Cocoa, coffee, rubber, plantain and cassava.

Indicator	Value
Annual rainfall, 1991-2020	993 mm
Reference evapotranspiration	1,321 mm
Annual water deficit	328 mm
Months with less than 50 mm of rain	3
Global solar radiation	1,909 kWh/m²
Mean temperature	25.9 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Gôh-Djiboua (Gagnoa)

The heart of the forest zone: Cocoa, coffee, rubber and rice.

Indicator	Value
Annual rainfall, 1991-2020	1,152 mm
Reference evapotranspiration	1,262 mm
Annual water deficit	110 mm
Months with less than 50 mm of rain	2
Global solar radiation	1,932 kWh/m²
Mean temperature	25.2 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Lagunes (Dabou)

Near the lagoons: Oil palm, rubber, cassava and pineapple.

Indicator	Value
Annual rainfall, 1991-2020	1,890 mm
Reference evapotranspiration	1,305 mm
Annual water deficit	-585 mm
Months with less than 50 mm of rain	0
Global solar radiation	1,944 kWh/m²
Mean temperature	25.9 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Bas-Sassandra (San-Pédro)

The country's main cocoa basin, with rubber and oil palm; an export port.

Indicator	Value
Annual rainfall, 1991-2020	1,388 mm
Reference evapotranspiration	1,283 mm
Annual water deficit	-105 mm
Months with less than 50 mm of rain	0
Global solar radiation	2,013 kWh/m²
Mean temperature	25.7 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Abidjan (autonomous district) (Abidjan)

Market gardening, cassava and food crops for the economic capital; the country's main port.

Indicator	Value
Annual rainfall, 1991-2020	1,851 mm
Reference evapotranspiration	1,290 mm
Annual water deficit	-561 mm
Months with less than 50 mm of rain	0
Global solar radiation	1,864 kWh/m²
Mean temperature	25.6 °C

Source: ERA5 via Open-Meteo (A9); PVGIS (A8); author's calculation.

Annex A. Sources and confidence levels

Ref.	Source	Level
A1	World Bank, World Development Indicators (WDI), Côte d'Ivoire	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	ERA5 (Copernicus), via Open-Meteo: Rainfall, reference evapotranspiration, temperature, 1981-2024	B
A10	Natural Earth, first-level administrative boundaries and country outline	B
A11	FAO, AQUASTAT, Côte d'Ivoire country profile: Irrigation potential	A
A12	ECOWAS common external tariff (heading 3906.90.00.00: Customs duty, statistical fee, levies); Côte d'Ivoire general tax code (VAT)	A
A13	ECOWAS Regulation C/REG.13/12/12 on fertiliser quality control	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 (1,162 Mm³, 2022) × agricultural share (51.64%) = 600.0 Mm³.

2. Irrigation. The equipped area (72,750 ha) and agricultural water are shared between irrigated groups (rice, vegetables and sugar cane and dessert banana) in proportion to their harvested areas (973,818 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. Cocoa, coffee, cashew, rubber and oil palm are treated as rainfed.

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 (8,247 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%), 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 ERA5 grid cell containing each city; radiation: PVGIS, 2005-2020. Temperature trends are linear regressions over 1981-2024. ERA5 is a reanalysis: Its rainfall can differ from local station records. On the maps, each district is shown as a point at its capital: Natural Earth does not provide the district boundaries.

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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The Bandama river.

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