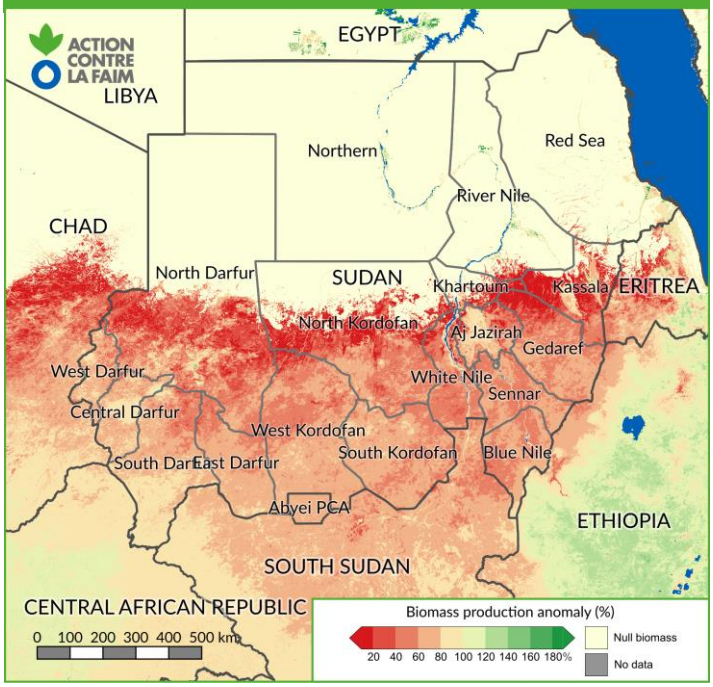


BIOMASS PRODUCTION IN 2026 ANALYSIS AND OUTLOOK FOR 2027

SUDAN

ACTION AGAINST HUNGER
ACTION CONTRE LA FAIM

MAP 1: ANOMALY OF BIOMASS PRODUCTION FOR YEAR 2026 IN PERCENT



HIGHLIGHTS

- Growing food insecurity: FEWS NET October 2026 Outlook brief projects that 21.0-21.99 million people (45-50% of Sudan's population) will require urgent food assistance by April 2027.
- Widespread biomass decline: 17 out of 19 states/areas recorded below-average biomass in 2026, with the most severe anomalies in Abyei PCA and South Kordofan (-2.0σ).
- Agricultural stress: Rainfall deficits in Sennar and Gedaref (20% and 30%) and poor cropland vegetation in Darfur and Kordofan indicate significant production and water constraints (FAO/IPC).
- Deteriorating seasonal trends: Several states, including North, West and Central Darfur, North Kordofan and Kassala, shifted from above-average biomass in 2024/25 to below-average conditions in 2026.
- Conflict and displacement pressures: Insecurity is restricting pastoral mobility and displacing herders with their livestock, increasing pressure on grazing, water and land resources in receiving areas.

INTRODUCTION

Sudan's agricultural and pastoral production systems are highly dependent on seasonal rainfall and natural vegetation, making them particularly vulnerable to rainfall variability, drought and the impacts of conflict. Rainfall conditions have varied considerably in recent years: 2023 saw deficits across parts of southeastern Sudan, while 2024 experienced above average and well-distributed rainfall, supporting improved cereal production. In 2025, rainfall was moderately below average but relatively evenly distributed; by contrast, the 2026 growing season saw more widespread rainfall deficits, including 20% below average in Sennar and 30 % in Gedaref, with FAO's Agricultural Stress Index indicating severe drought conditions across significant areas of cropland.

This brief examines state-level biomass anomalies during 2026, compares vegetation conditions with previous years, and considers the implications for crop production, pasture availability and pastoral livelihoods during the 2026/27 dry season and the 2027 agricultural season. It draws on available biomass data and complementary evidence from IPC's October 2026 Alert and FEWS NET's October 2026 Food Assistance Outlook Brief to highlight geographical priorities, emerging risks and considerations for response planning.

DESCRIPTION OF THE SYSTEM

WHAT IS BIOMASS AND HOW IS IT MEASURED?

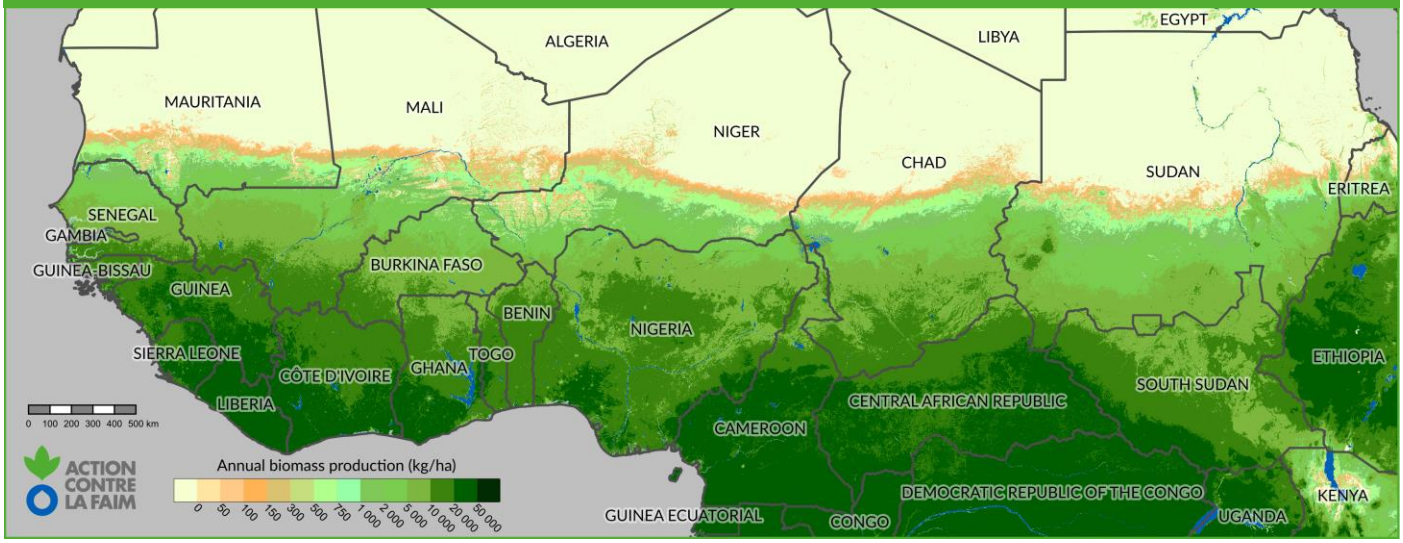
Biomass is the total production of vegetal matter measured in kilograms of dry matter per hectare (kg/ha). The term dry matter is used to describe any form of vegetation above the ground regardless of its water/moisture content. For an analysis of the pastoral situation, biomass is an effective way to measure the availability of fodder resources.

Biomass production is calculated from satellite images collected by the European Space Agency's SPOT-VEGETATION, PROBA-V and SENTINEL-3 satellites and provided, in form of 10-day products, by the European Copernicus Land Monitoring Service CLMS programme.

The method for calculating daily biomass productivity (kg/ha/day) is based on an algorithm integrating biophysical parameters obtained from satellite images as well as climatic parameters of temperature and solar irradiance.

The BioGenerator tool developed by ACF integrates all these data to produce an annual biomass production map calculated over the growing season coinciding with the rainy season in the Sahel. The spatial resolution is 300 m, which corresponds to that of the satellite products used. The period covered is the one of the available satellite archives from 1999 to the present.

MAP 2: AVERAGE ANNUAL BIOMASS PRODUCTION 1999-2026



WHAT ARE THE INDICATORS GENERATED?

The first indicator is the annual biomass production calculated over the growing season:

- Annual production in kg/ha

The annual biomass production is compared to the average calculated over all the years since 1999 in order to highlight the anomaly which is represented in two ways:

- Anomaly expressed as a percentage of the mean value %
- Normalised anomaly expressed as the number of standard deviations σ from the mean

A vulnerability index linked to biomass availability, named « VI » (Vulnerability Index), is calculated recursively by weighting the most recent years in order to take into account the sequence of dry or rainy events:

- Vulnerability Index VI

Indicators are visualisable and downloadable at the following links:

- geosahel.info
- data.humdata.org/organization/acf-west-africa

BIOMASS PRODUCTION IN 2026

MAPPING OF THE BIOMASS PRODUCTION ANOMALY

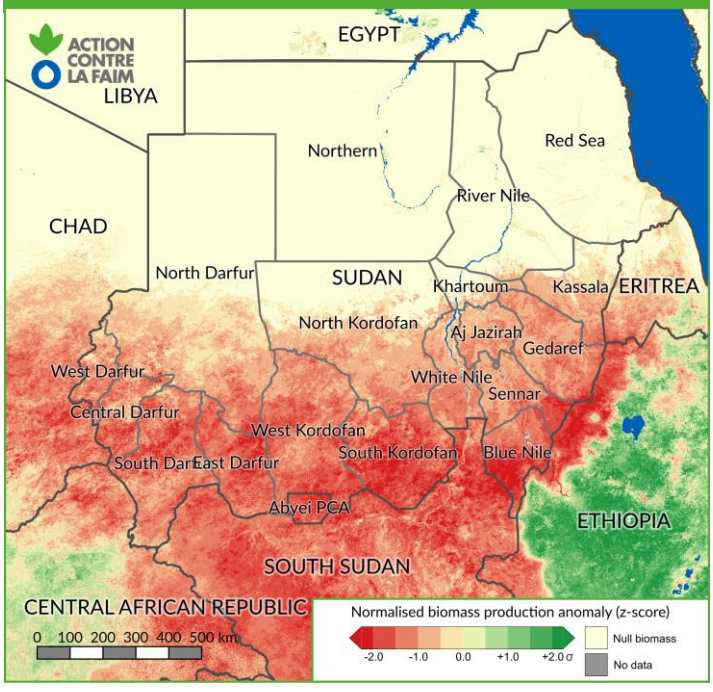
The biomass production anomaly across Sudan in 2026, expressed as a percentage of the long-term average, while the accompanying data present the same anomaly in terms of standard deviations (σ) from the mean.

Biomass production was below average across most of Sudan, with negative anomalies recorded in 17 of the 19 states and administrative areas covered by the dataset. The most pronounced deficits were concentrated across Darfur, Kordofan and parts of the central and eastern agricultural belt. North Darfur, North Kordofan, White Nile, Kassala and Blue Nile were among the areas recording particularly low biomass levels. In contrast, Northern and River Nile maintained above-average conditions, while Red Sea remained close to its long-term average.

This pattern is consistent with wider evidence of deteriorating rainfall and vegetation conditions. FAO's September 2026 GIEWS update reported significant seasonal rainfall deficits in Sennar and Gedaref, with severe agricultural drought conditions affecting substantial proportions of cropland. Similarly, the IPC Alert of 12 October 2026 highlighted poor plant biomass across large areas of North Darfur, South Darfur, West Kordofan and South Kordofan, alongside severe water deficits. These findings provide complementary evidence of increasing pressure on agricultural and natural resources in several parts of the country.

The situation is particularly concerning for pastoral and agro-pastoral livelihoods. Reduced biomass availability, combined with water shortages, conflict and displacement, is likely to constrain access to grazing areas and traditional livestock migration routes. Insecurity and restricted mobility may further limit the ability of livestock keepers to reach alternative pasture and water sources, increasing pressure on already stressed resources.

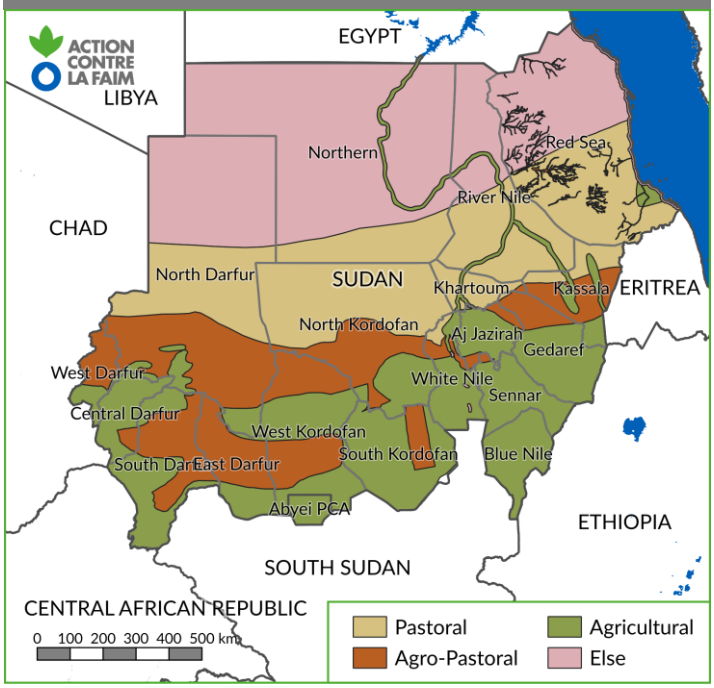
MAP 3: NORMALISED BIOMASS PRODUCTION ANOMALY YEAR 2026



INTERANNUAL VARIATIONS IN BIOMASS PRODUCTION

The comparison of biomass anomalies between 2022 and 2026 highlights considerable interannual variability across Sudan. Several states experienced favourable biomass conditions in 2024 and 2025, followed by a widespread deterioration in 2026.

MAP 4: REGIONAL LIVELIHOODS ZONES

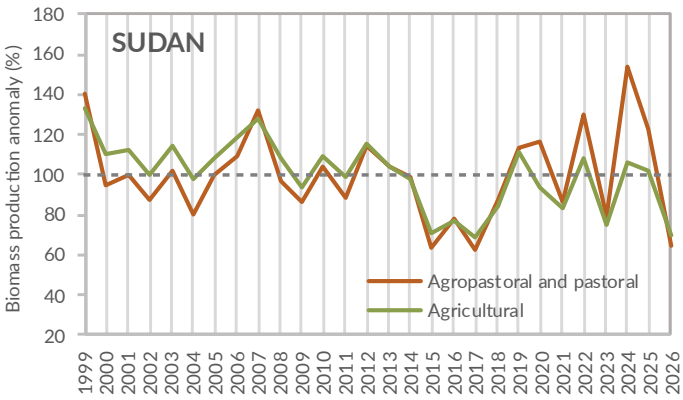


The decline was particularly pronounced across Greater Darfur and Greater Kordofan. North Darfur, for example, fell from 258% of its long-term average in 2024 and 168% in 2025 to 57% in 2026. Similar downward trends were observed in Central and West Darfur, as well as across the three Kordofan states.

A comparable deterioration occurred across the eastern and central agricultural belt, particularly in Kassala, Gedaref, Sennar and White Nile. In contrast, Northern and River Nile maintained relatively favourable conditions, remaining above their long-term averages in 2026, although below their 2024 and 2025 levels.

The overall trend is consistent with the deterioration in vegetation conditions that can be further examined through WFP's historical NDVI data and FAO's satellite-based vegetation and agricultural stress indicators. These complementary sources provide additional insight into the spatial and temporal variability of vegetation conditions across Sudan.

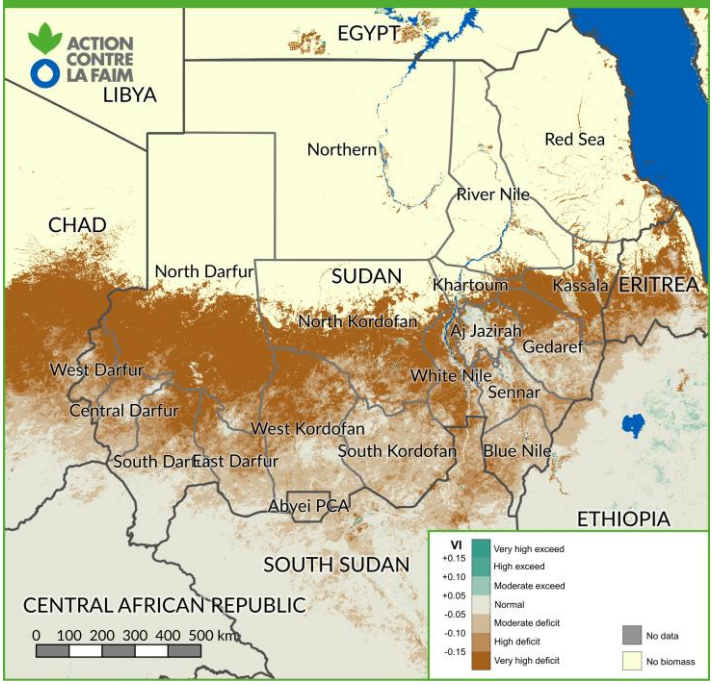
This reversal in biomass production is particularly concerning for rainfed agricultural, agropastoral and pastoral livelihoods, where households depend on seasonal vegetation and natural resources for crop production, livestock grazing and income generation.



COMPARISON OF 2026 WITH RECENT YEARS

The Vulnerability Index (VI) related to biomass, represented by Map 5, reflects variations in biomass production over recent years and highlights areas experiencing significant departures from their historical averages.

MAP 5: BIOMASS VULNERABILITY INDEX 2026



Following the 2026 rainy season, biomass production conditions across Sudan were generally below average. Negative anomalies were recorded in 17 of the 19 states and administrative areas covered by the dataset, indicating a widespread deterioration in vegetation conditions. The most pronounced deficits were observed across parts of Darfur, Kordofan and the central and eastern agricultural belt. In contrast, Northern and River Nile recorded above-average biomass production, while Red Sea remained close to its long-term average.

At the regional level, the distribution of biomass anomalies highlights considerable geographical differences. Areas across Darfur and Kordofan, alongside parts of Blue Nile, White Nile and the eastern states, experienced below-average biomass conditions. These deficits are particularly relevant for pastoral and agropastoral livelihoods, given the importance of seasonal vegetation for livestock grazing and access to natural resources. Conflict, displacement and restricted population movements may further constrain access to alternative grazing areas and water sources.

The table below presents biomass production anomalies across Sudan from 2022 to 2026, expressed both as standard deviations from the mean and as a percentage of the long-term average. It highlights considerable interannual variability, with several states experiencing favourable conditions in 2024 and 2025 before a widespread decline in 2026. The deterioration was particularly pronounced in areas of Darfur, Kordofan and the eastern and central agricultural belt.

North Darfur, for example, declined from 168% of its long-term average in 2025 to 57% in 2026, while North Kordofan fell from 130% to 56%. Similar declines were recorded in Kassala, Sennar and Blue Nile. In terms of standard deviations, Abyei PCA and South Kordofan recorded the most pronounced negative anomalies, at -2.0σ, followed by Blue Nile, East Darfur and West Kordofan, at -1.8σ.

The supplied VI values also indicate negative readings across all listed states and administrative areas, with the most negative values recorded in Khartoum, Kassala and North Darfur. These values should be interpreted in accordance with the dataset's methodology and should not, on their own, be treated as a direct ranking of current livelihood vulnerability.

External evidence provides further context for the 2026 situation. FAO GIEWS reported significant seasonal rainfall deficits and severe agricultural stress in Sennar and Gedaref, while the IPC October 2026 Alert highlighted poor plant biomass and severe water deficits across parts of Darfur and Kordofan.

Overall, the available evidence points to a widespread deterioration in biomass production during 2026, with potentially significant implications for grazing availability, livestock-based livelihoods and the natural resource base on which pastoral and agropastoral households depend.

The table below presents biomass production anomalies across the 19 monitored localities in Sudan, expressed both in terms of standard deviations from the mean and as a percentage of the long-term average. It highlights a widespread below-average situation, with negative anomalies recorded across most localities. However, the severity varies geographically, with particularly pronounced deficits in parts of Darfur, Kordofan and the central and eastern regions.

State	Area (km^2)	Anomaly 2022	Anomaly 2023	Anomaly 2024	Anomaly 2025	Anomaly 2026	VI 2026
Abyei PCA	10537	+0.6σ (109%)	-1.8σ (074%)	+0.0σ (101%)	+0.2σ (103%)	-2.0σ (070%)	-0.07
Aj Jazirah	27154	-0.0σ (100%)	-1.4σ (073%)	-0.4σ (093%)	-0.7σ (087%)	-1.3σ (075%)	-0.11
Blue Nile	38165	-0.1σ (099%)	-1.3σ (075%)	-0.2σ (095%)	-0.3σ (094%)	-1.8σ (063%)	-0.08
Central Darfur	30961	+1.5σ (121%)	+0.1σ (102%)	+2.0σ (128%)	+1.2σ (116%)	-1.5σ (079%)	-0.10
East Darfur	50775	+0.9σ (116%)	-1.6σ (072%)	+0.8σ (114%)	+0.1σ (102%)	-1.8σ (069%)	-0.10
Gedaref	59542	-0.1σ (096%)	-1.5σ (054%)	+0.3σ (110%)	-0.0σ (099%)	-1.3σ (061%)	-0.14
Kassala	48698	+0.9σ (131%)	-1.3σ (056%)	+1.8σ (164%)	+0.5σ (119%)	-1.2σ (058%)	-0.32
Khartoum	21217	+1.0σ (139%)	-0.7σ (073%)	+1.5σ (159%)	+0.1σ (103%)	-0.9σ (066%)	-0.36
North Darfur	317221	+1.0σ (149%)	+0.0σ (101%)	+3.4σ (258%)	+1.5σ (168%)	-0.9σ (057%)	-0.31
North Kordofan	186149	+1.3σ (145%)	-1.4σ (050%)	+1.3σ (148%)	+0.8σ (130%)	-1.2σ (056%)	-0.27
Northern	364120	+1.4σ (149%)	+1.3σ (144%)	+1.7σ (160%)	+1.1σ (138%)	+0.2σ (108%)	-0.12
Red Sea	215609	+0.7σ (138%)	+0.9σ (144%)	+3.7σ (292%)	+1.4σ (170%)	-0.0σ (098%)	-0.25
River Nile	130405	+1.4σ (154%)	+1.0σ (140%)	+2.6σ (201%)	+1.7σ (165%)	+0.1σ (105%)	-0.26
Sennar	39257	+0.2σ (106%)	-1.5σ (058%)	-0.1σ (097%)	-0.4σ (089%)	-1.4σ (061%)	-0.08
South Darfur	85824	+0.7σ (109%)	-1.1σ (086%)	+0.9σ (111%)	+0.2σ (102%)	-1.6σ (080%)	-0.08
South Kordofan	79331	+0.3σ (106%)	-1.8σ (069%)	-0.4σ (092%)	+0.2σ (104%)	-2.0σ (066%)	-0.07
West Darfur	22257	+1.3σ (130%)	+0.1σ (103%)	+2.6σ (159%)	+1.9σ (144%)	-1.2σ (072%)	-0.14
West Kordofan	106309	+1.0σ (119%)	-1.8σ (065%)	+0.6σ (112%)	+0.3σ (106%)	-1.8σ (065%)	-0.12
White Nile	37994	+0.8σ (125%)	-1.4σ (056%)	+0.6σ (119%)	-0.5σ (085%)	-1.4σ (058%)	-0.17
Whole country	1871528	+0.8σ (114%)	-1.4σ (076%)	+1.1σ (119%)	+0.4σ (108%)	-1.8σ (068%)	-0.17

CONCLUSION

WINTERING SEASON 2026

The 2026 rainy season was characterised by below-average rainfall and deteriorating vegetation conditions across much of Sudan. The state-level biomass data set indicates that production was below the long-term average in 17 of the 19 states and administrative areas covered, with particularly pronounced deficits across parts of Darfur, Kordofan and the central and eastern agricultural belt. Northern and River Nile were among the few areas recording above-average biomass production.

The deterioration in biomass conditions was accompanied by significant agricultural stress. FAO GIEWS reported substantial rainfall deficits and severe agricultural stress in Sennar and Gedaref, while the IPC October 2026 Alert highlighted poor plant biomass and severe water deficits in parts of North Darfur, South Darfur, West Kordofan and South Kordofan. These conditions point to a difficult agricultural season, with implications for crop production, household food stocks and agricultural income. For pastoral and agropastoral communities, reduced vegetation growth and water availability are likely to increase pressure on grazing resources and water points during the 2026/27 dry season. Livestock feeding conditions, animal body condition and access to seasonal grazing areas may deteriorate, particularly in locations where insecurity and displacement restrict traditional livestock movements. The IPC also highlights the potential effects of failed rains on livestock markets and agricultural labour opportunities, further affecting household income.

The impact of these environmental pressures is compounded by conflict and large-scale displacement. More than 300,000 people have reportedly been displaced in Greater Kordofan since October 2025, while Tawila in North Darfur is hosting more than 650,000 internally displaced people. Insecurity, restricted access to agricultural land and natural resources, and pressure on water and grazing areas are likely to intensify competition over available resources in affected locations.

Overall, Sudan enters the 2026/27 dry season with significant pressure on agricultural and pastoral livelihoods. The severity of the impact will vary geographically, depending not only on biomass and water availability but also on security, displacement, market functionality, access to land and the ability of communities to move and sustain their livelihoods.

OUTLOOK FOR 2027

The 2027 outlook remains concerning, as agricultural recovery will depend on next season's rainfall and conflict-affected households' access to land, productive assets, markets and essential inputs.

Four interconnected areas of concern emerge for the coming months and the 2027 agricultural season.

Greater Darfur-deteriorating agricultural conditions and pressure on natural resources
The Poor biomass conditions, localized crop failures, water deficits and displacement threaten agricultural and pastoral livelihoods across Greater Darfur. North Darfur recorded biomass levels at just 57% of its long-term average in 2026. IPC also highlights severe food security and agricultural concerns, particularly in displacement-affected areas such as Tawila, where restricted access to farmland, grazing and water further constrains livelihood recovery and increases pressure on available resources.

Greater Kordofan-severe vegetation deficits and restricted livelihood access
West, North and South Kordofan recorded substantial negative biomass anomalies in 2026, alongside poor vegetation conditions and severe water deficits reported by IPC. Conflict and displacement further restrict access to farmland, grazing areas, markets and traditional livestock routes, threatening agricultural recovery, livestock productivity and access to natural resources.

Central and Eastern agricultural belt- rainfall deficits and production risks
Sennar, Gedaref, Blue Nile, White Nile and Kassala recorded below-average biomass production in the state-level dataset. FAO GIEWS specifically reported significant rainfall deficits and severe agricultural stress in Sennar and Gedaref. These conditions raise concerns about crop establishment, production prospects, household stocks and agricultural income. Continued monitoring of rainfall, vegetation conditions, water availability and agricultural performance will be particularly important in these areas.

Pastoral and agropastoral areas-pressure on grazing, water and livestock mobility

Across affected pastoral and agropastoral areas, below-average biomass and water shortages may reduce dry-season grazing availability, while conflict and displacement restrict livestock movements and access to alternative pastures. Concentration of livestock around accessible grazing and water points may further increase pressure on natural resources. Nationally, FEWS NET projects that 21.0-21.99 million people (45-50% of Sudan's population) will require urgent food assistance in April 2027, highlighting the wider humanitarian crisis rather than directly forecasting biomass conditions.

Prospects for recovery in 2027

A recovery in agricultural production and vegetation conditions remains possible if rainfall improves during the next agricultural season. However, rainfall alone will not be sufficient to restore livelihoods in areas where conflict has disrupted agricultural activities, destroyed productive assets, restricted access to land or weakened market systems. Recovery will also depend on the availability and affordability of seeds, tools, fuel and other agricultural inputs, alongside access to finance, labour, functioning markets, water and essential livestock services.

The 2027 outlook should therefore be considered conditional on both climatic and conflict-related developments. Continued monitoring of rainfall and vegetation anomalies, agricultural production, grazing conditions, water availability, livestock movements, displacement and market access will be essential to identify emerging hotspots and inform timely humanitarian and livelihood responses.

RECOMMENDATIONS

- Prioritize areas with the most severe biomass and agricultural stress, considering conflict, displacement and operational access.
- Strengthen monitoring of rainfall, vegetation, pasture and water availability through satellite data and regular field observations.
- Support climate-informed agricultural recovery through context-specific seeds and inputs, water harvesting, small-scale irrigation and soil and water conservation, particularly where water is the main constraint.
- Protect pastoral and agropastoral livelihoods by improving access to grazing and water resources and strengthening livestock health services.
- Integrate state-level biomass data with FAO GIEWS, IPC and FEWS NET findings to guide geographical prioritization and seasonal programming.
- Address conflict-related barriers to livelihoods, particularly displacement and restricted access to farmland, markets, grazing areas and water resources.
- Regularly review rainfall, vegetation, crop development, harvest prospects and pastoral conditions to adjust geographical priorities and inform the 2027 response.

The data used for the calculation of biomass production comes from the data generated by the COPERNICUS land service, the European Commission's Earth observation programme. The research that led to the current version of the product was funded by various European Commission research and technical development programmes. The product is based on data from the SENTINEL-3, PROBA-V and SPOT-VEGETATION satellites of the European Space Agency ESA.

Action Against Hunger
Sudan Office
Block 2, Building Number 247,
Hai Almatar, Port Sudan, Sudan

Action Against Hunger
Regional Office for West and Central Africa ROWCA
Ngor Almadies N°13 Bis, Rue NG 96, BP 29621, Dakar, Senegal

Surveillance and Data Analysis Department: Erwann FILLOL
Email: erfillol@wa.acfspain.org
Portal: sigsahel.info

ACTION AGAINST HUNGER ACTION CONTRE LA FAIM