

# **BIOMASS PRODUCTION AT RAINY MID-SEASON 2022**

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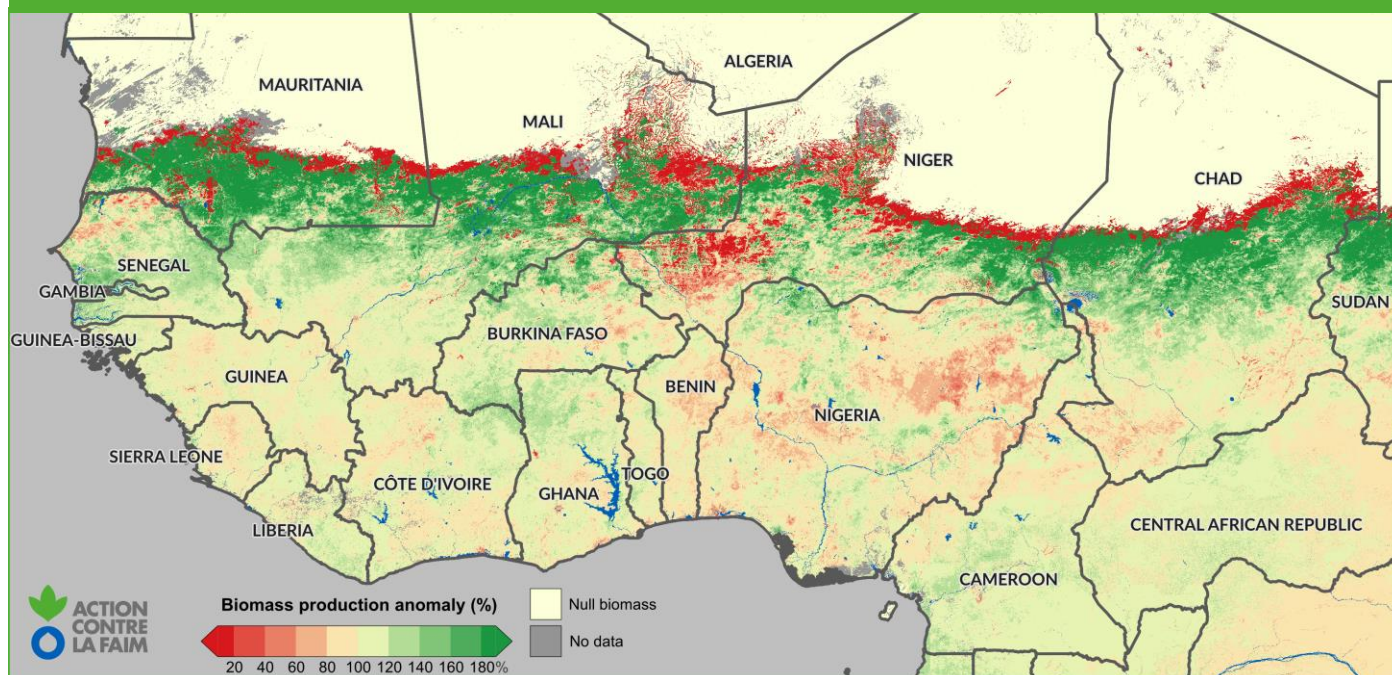
## **SAHEL REGIONAL BULLETIN**

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MAP 1: ANOMALY OF BIOMASS PRODUCTION AT END OF AUGUST 2022



## HIGHLIGHTS

- Early start to the rainy season in the Sahel with good rainfall
- Rainfall breaks observed at the beginning of the season
- Very good biomass production in central and southern Senegal, central and southern Mali, Burkina Faso, and central Chad
- Below normal biomass production in northern Senegal, southwestern Mauritania
- Much below normal biomass production in the tri-border area, particularly in southwestern Niger
- Below normal biomass production in coastal countries, particularly Benin and Nigeria, and below normal production in Togo and Côte d'Ivoire
- End of rainy season expected to be favourable across the Sahel

## INTRODUCTION

This document presents an assessment of the quality of the crop production season in West and Central Africa. The analysis is limited to the Sahelian zone of West Africa and provides a status of biomass production at mid-wintering season (end of August).

The year 2022 follows a wintering season in 2021 that was negative but close to normal for almost the entire Sahelian zone, with several pastoral zones recording negative biomass production anomalies.

The economic context of the region is still marked by the consequences of the Russian-Ukrainian conflict, in addition to the long-term repercussions of the measures taken by the states to combat COVID-19.

The frequency of climatic extremes further increases people's vulnerability, and the 2022 rainy season is marked by heavy flooding.

There has been a gradual reopening of national and cross-border transhumance corridors following the reduction of restrictions linked to the COVID-19 pandemic. However, blockades and access restrictions are still applied in the coastal countries.

Security incidents, such as theft, looting, threats to people, destruction of property and killings, are reported, particularly in the tri-border region (Burkina Faso, Mali, and Niger).



## DESCRIPTION OF THE SYSTEM

### WHAT IS BIOMASS AND HOW IS IT MEASURED?

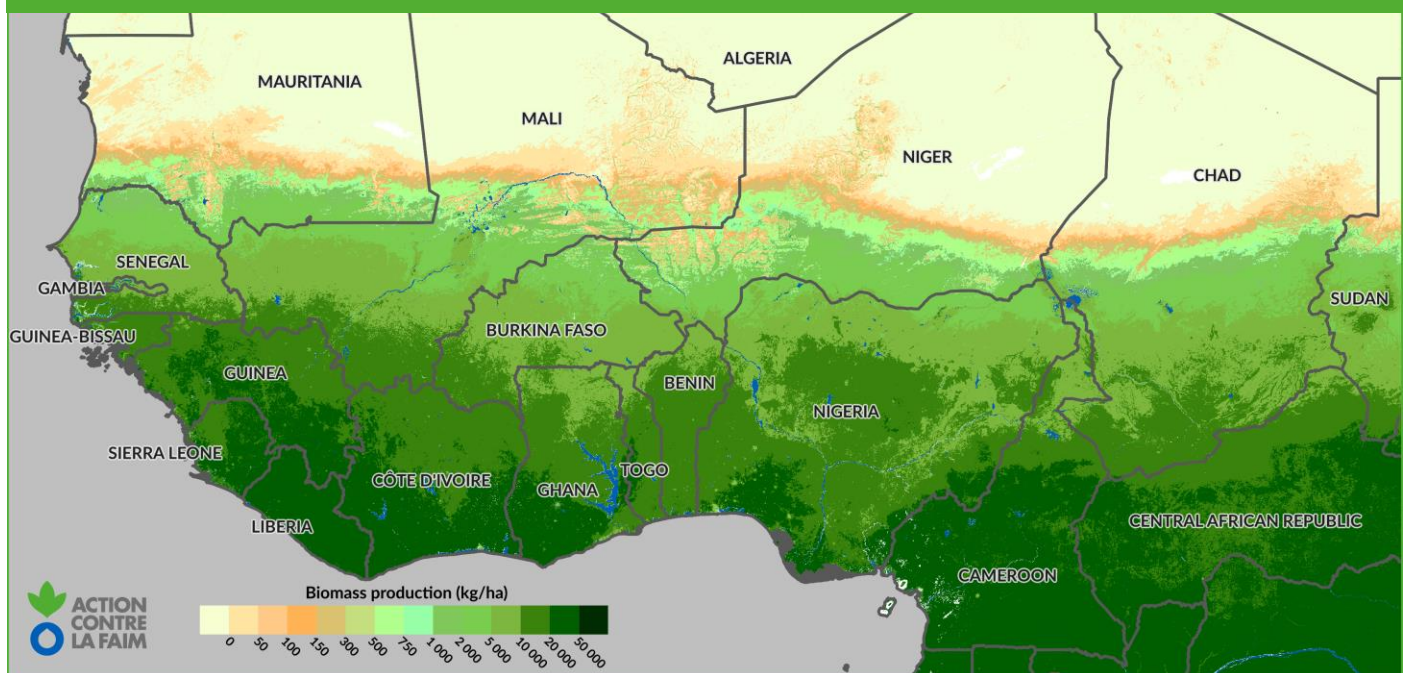
Biomass is the total production of vegetal matter measured in kilograms of dry matter MS per hectare kg/ha. The term dry matter is used to describe any form of vegetation above the ground regardless of its water/moisture content. For an analysis of the pastoral situation, biomass is an effective way 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 programme through the Flemish Institute of Technology VITO.

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 1 km, 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 1999-2021**



### 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 1998 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  $\sigma$  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**

The methods used and details of how BioGenerator works are available at: [www.sigsahel.info/index.php/section/tele/](http://www.sigsahel.info/index.php/section/tele/)

## BIOMASS PRODUCTION AT MID-SEASON 2022

### MAPPING THE BIOMASS PRODUCTION ANOMALY

Map 1 shows the biomass production anomaly calculated at mid-growing season in the Sahel expressed as a % of the mean and sensitive to absolute variations in the amount of biomass produced. Map 3 shows the same anomaly but expressed as a number of standard deviations  $\sigma$  from the mean, called the normalised anomaly, with sensitivity to relative variations in the amount of biomass produced.

These maps show good production throughout West Africa and the Sahel. However, a part of the central Sahel, notably Niger towards Tillabéri, has a production deficit to a very large deficit. In addition to the part of northern Senegal and south-western Mauritania, the far northern strip of the Sahel from Mauritania to Chad has a slight production deficit.

The most pronounced deficits are in the Niger part, but the tri-border region has areas where production is lower than in previous years.

Despite localized negative anomalies, the Malian part of the region has a good production, while the southern part of the region towards the coastal countries has an average to negative production.

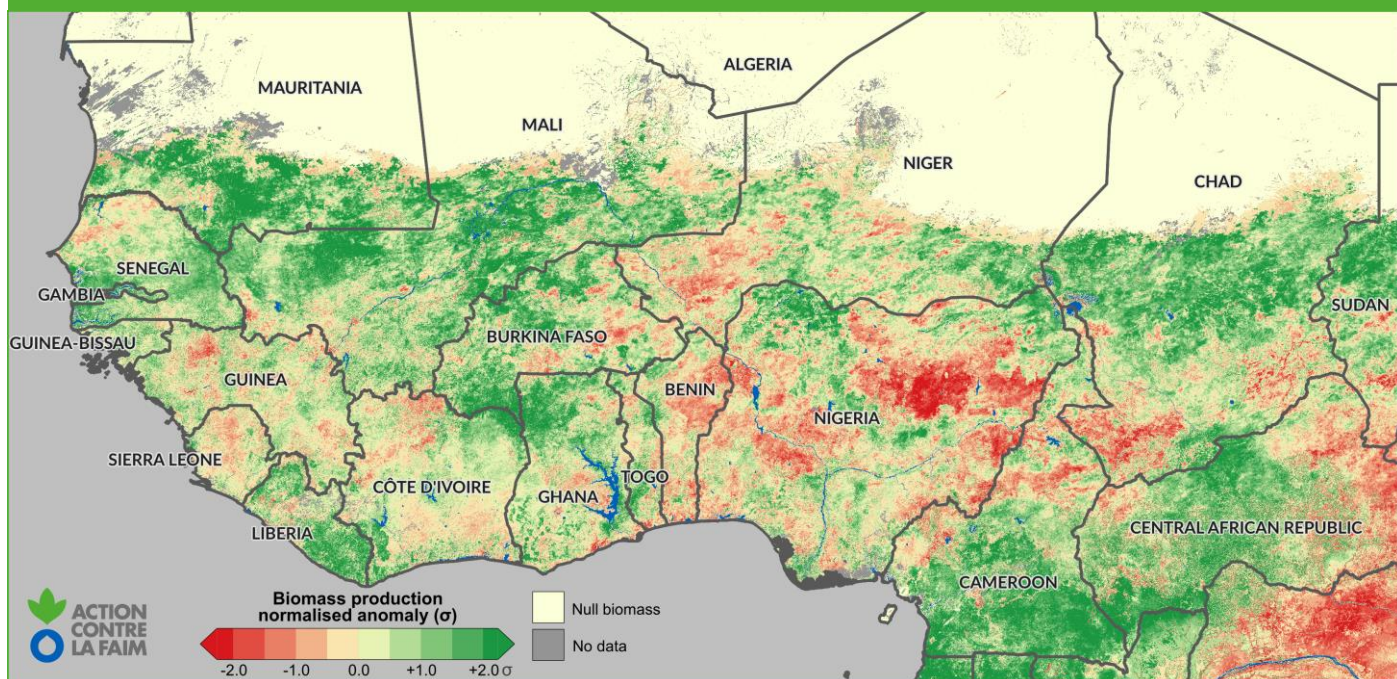
The part composed of central and southern Senegal, south-eastern Mauritania, southern and south-eastern Mali and almost all of Burkina Faso, except for the east, recorded good production.

Chad, particularly the centre of the country, has good to very good production, while the north of Cameroon has average to good production.

When analysed at the country level, only Niger recorded a negative and worrying anomaly.

The coastal countries as a whole record deficit anomalies. The deficits are more pronounced in Nigeria, Benin, and Côte d'Ivoire. These deficits must be taken with care because they concern concentration areas for trans-border transhumant animals from Sahelian countries to coastal countries.

**MAP 3: NORMALISED BIOMASS PRODUCTION ANOMALY AT END OF AUGUST 2022**



### THE 2022 GROWING SEASON

The figure on the following page shows the instantaneous biomass production profiles for some regions (level 1 administrative division) selected as representative.

In Burkina Faso, the Sahel region shows a normal start to the season, followed by a good above-average production.



In the Gao region of Mali, production started at the normal time but suffered a slight delay at the beginning of July before resuming very strong growth.

Niger has a contrasting situation. The Tillabéri region had an early start but was marked by delayed growth and below-average production. However, in the Zinder region, a normal start was observed with good growth.

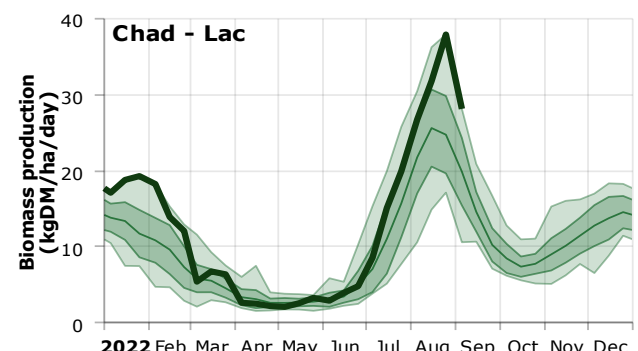
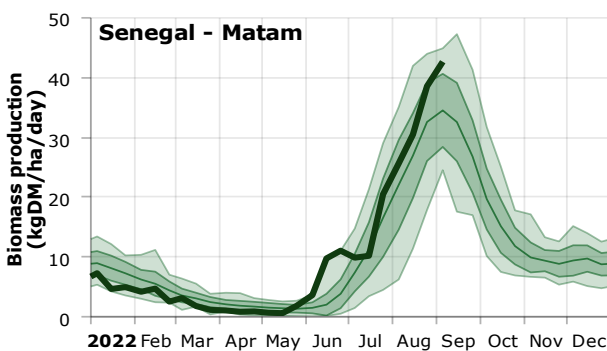
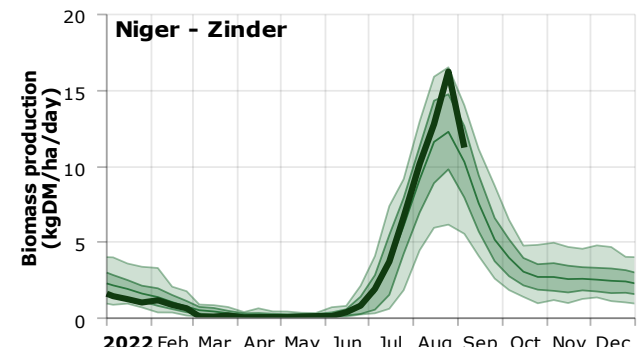
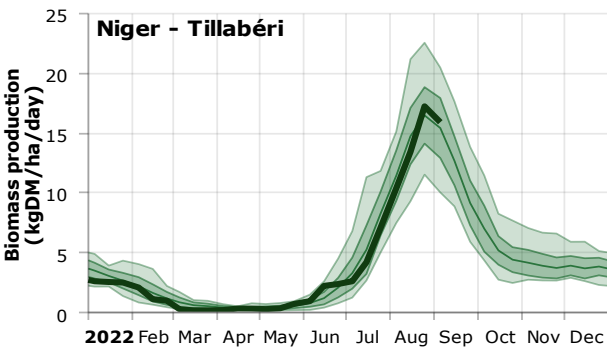
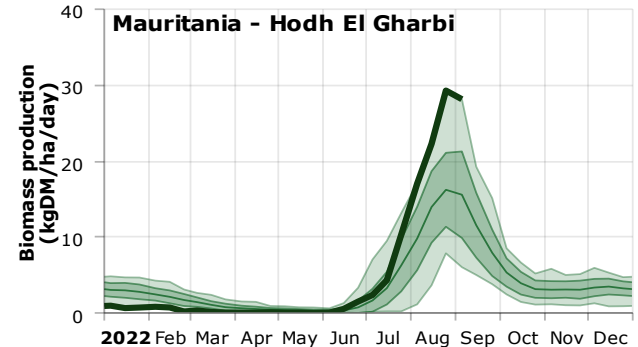
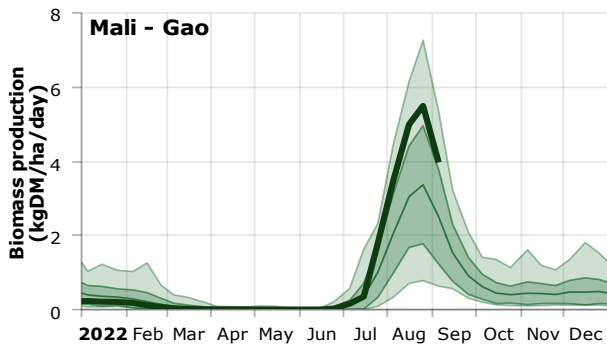
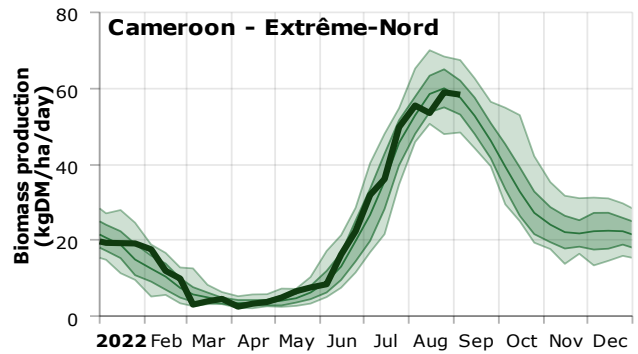
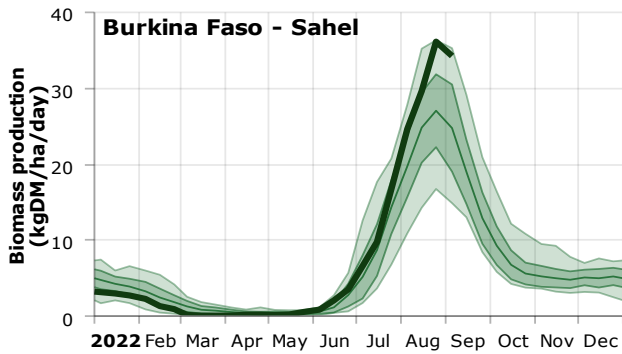
In the Wilaya of Hodh El Gharbi in Mauritania, with a normal start to the winter season, growth is normal and marked by very good production, well above average.

In the Matam region of Senegal, the season started early with very strong growth, but the dry spell of about four weeks between June and July caused a delay in growth. Production in this region is good as it is above average.

Cameroon's Far North region got off to a normal start with good growth, followed by a stall from mid-August.

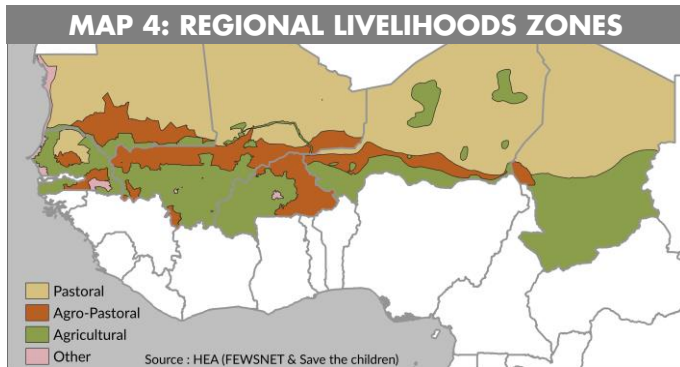
In the Lake Chad region, production, after an early start, remains very good.

Over the whole region, the growth trend is good. This will be confirmed by the behaviour at the end of the rainy season.



## INTER-ANNUAL VARIATION IN BIOMASS PRODUCTION

Based on the livelihood zone breakdown (Map 4), it is possible to observe inter-annual variations in biomass production according to land use: Agricultural, Pastoral and Agropastoral (source: Household Economy Analysis HEA / FEWSNET & Save the children).

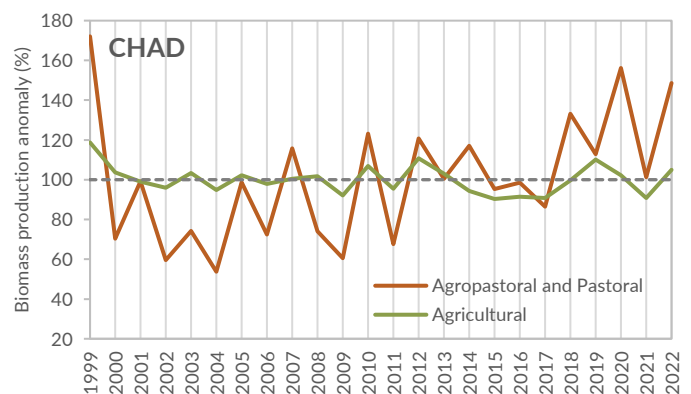
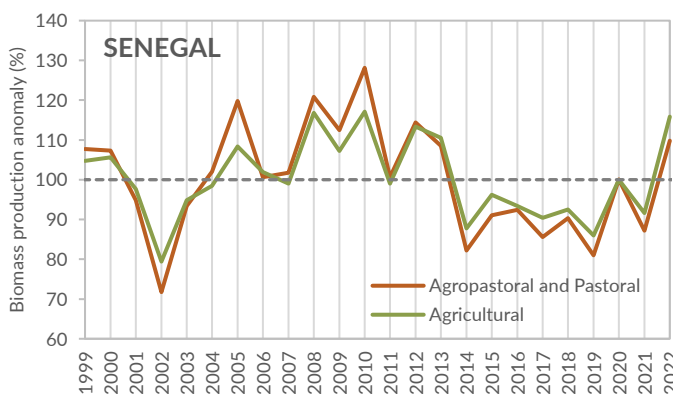
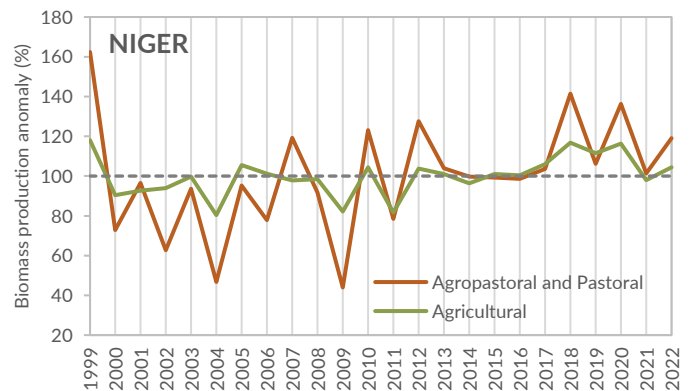
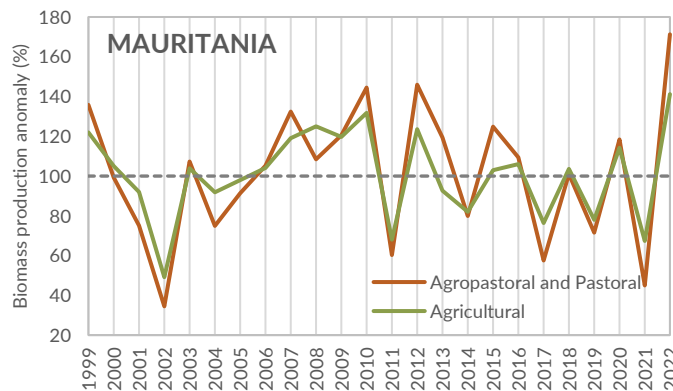
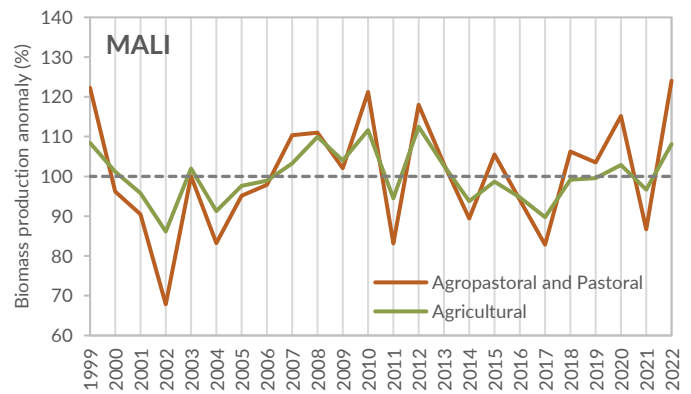
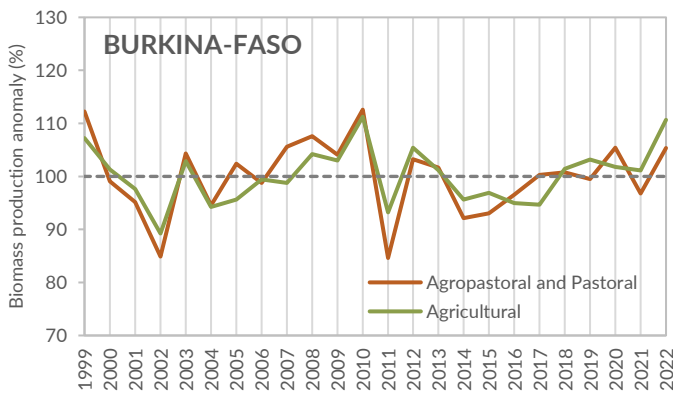


For the elaboration of these comparisons the initial Agropastoral and Pastoral classes are combined to obtain statistic on the complete pastoral use area.

The graphs below show a year 2022 that is overall much better than the previous year (2021) but also above the normal values (1999-2021) despite some clear variations.

At the country level, Mauritania has the best production, followed by Senegal and Mali. The latter benefits this year from a very good production for its pastoral and agro-pastoral areas.

Niger has values close to the average. Production in the agricultural zones of this country and Chad, which are the weakest in the region, are just above normal.



## COMPARISON OF 2022 WITH RECENT YEARS

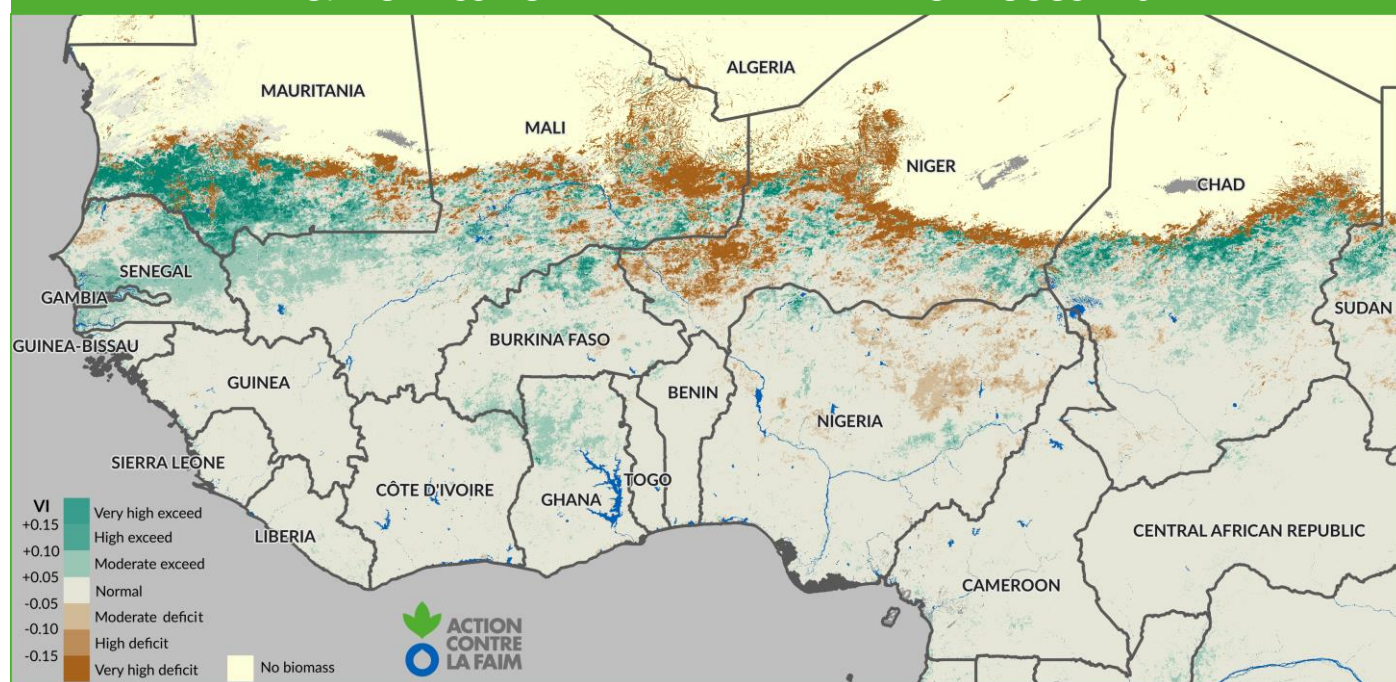
The vulnerability index VI linked to biomass, represented by Map 5, is sensitive to the variations in production recorded over the last few years and highlights the areas with successive biomass deficits.

The VI index calculated at the end of August 2022 shows positive values for most of West Africa and the Sahel, particularly for central and southern

Senegal, southern Mauritania, south-western and central-western Mali, the Burkina Faso region bordering Mali and central Chad.

The main reason for this is a good improvement in the year 2022 compared to the year 2021, when biomass production was lower.

**MAP 5: BIOMASS VULNERABILITY INDEX END OF AUGUST 2022**



The following table shows the biomass production anomalies, expressed as the number of standard deviations  $\sigma$  from the mean and as a % of the mean, for the six countries monitored and according to the administrative level 1 divisions (regions or wilayas).

This table shows globally positive anomalies for 2022 with normal to slightly positive vulnerability indices VI.

However, some regions are exceptions with significant negative values, notably Gao, Tombouctou, and Kidal in Mali, Agadez, Diffa and Tillabéri in Niger and the Ennedi and Tibesti regions in Chad.

At the country level, Burkina Faso and Senegal show positive vulnerability indices, while Niger and some regions of Chad show a negative VI.

Country	Region/Wilaya	Superficie (km <sup>2</sup> )	Anomaly 2017	Anomaly 2018	Anomaly 2019	Anomaly 2020	Anomaly 2021	VI 2021
Burkina Faso	Boucle du Mouhoun	33614	+0.7 $\sigma$ (105%)	+0.2 $\sigma$ (101%)	+0.3 $\sigma$ (102%)	-0.3 $\sigma$ (098%)	+1.7 $\sigma$ (112%)	+0.03
	Cascades	18054	-0.3 $\sigma$ (098%)	+1.4 $\sigma$ (107%)	+0.7 $\sigma$ (104%)	+1.5 $\sigma$ (108%)	+2.5 $\sigma$ (113%)	+0.03
	Centre	2773	+0.4 $\sigma$ (104%)	+0.1 $\sigma$ (100%)	+0.2 $\sigma$ (102%)	+0.9 $\sigma$ (108%)	+2.4 $\sigma$ (122%)	+0.05
	Centre-Est	14234	+0.5 $\sigma$ (103%)	+1.6 $\sigma$ (110%)	+0.4 $\sigma$ (102%)	+0.0 $\sigma$ (100%)	+0.3 $\sigma$ (102%)	-0.01
	Centre-Nord	19180	+0.1 $\sigma$ (101%)	-1.1 $\sigma$ (089%)	+0.8 $\sigma$ (109%)	-0.3 $\sigma$ (097%)	+1.1 $\sigma$ (111%)	+0.03
	Centre-Ouest	21433	+0.2 $\sigma$ (101%)	+0.3 $\sigma$ (102%)	-0.9 $\sigma$ (095%)	-0.0 $\sigma$ (100%)	+0.5 $\sigma$ (103%)	+0.01
	Centre-Sud	11742	+0.8 $\sigma$ (105%)	+0.7 $\sigma$ (104%)	+0.3 $\sigma$ (102%)	+0.6 $\sigma$ (103%)	+1.0 $\sigma$ (106%)	+0.01
	Est	46592	-0.5 $\sigma$ (097%)	-0.6 $\sigma$ (096%)	+0.1 $\sigma$ (101%)	-0.6 $\sigma$ (096%)	+0.1 $\sigma$ (101%)	+0.01
	Hauts-Bassins	25729	+0.3 $\sigma$ (101%)	+1.0 $\sigma$ (106%)	+0.5 $\sigma$ (103%)	-0.2 $\sigma$ (099%)	+1.2 $\sigma$ (107%)	+0.01
	Nord	16421	+0.7 $\sigma$ (108%)	-0.0 $\sigma$ (100%)	+0.5 $\sigma$ (106%)	-0.8 $\sigma$ (091%)	+1.5 $\sigma$ (117%)	+0.03
	Plateau Central	8977	+0.1 $\sigma$ (101%)	-0.4 $\sigma$ (097%)	-0.1 $\sigma$ (099%)	+0.3 $\sigma$ (102%)	+1.4 $\sigma$ (111%)	+0.03
	Sahel	36088	+0.5 $\sigma$ (108%)	-0.2 $\sigma$ (097%)	+1.5 $\sigma$ (124%)	-0.3 $\sigma$ (096%)	+1.3 $\sigma$ (121%)	+0.03
	Sud-Ouest	16327	-0.2 $\sigma$ (099%)	+1.1 $\sigma$ (107%)	+0.4 $\sigma$ (103%)	+0.8 $\sigma$ (105%)	+2.9 $\sigma$ (119%)	+0.04
Entire country	272386	+0.2 $\sigma$ (101%)	+0.4 $\sigma$ (102%)	+0.5 $\sigma$ (103%)	-0.0 $\sigma$ (100%)	+1.6 $\sigma$ (109%)	+0.02	



# 8 | 2022 RAINY MID-SEASON BIOMASS PRODUCTION OVER SAHEL

Country	Region/Wilaya	Superficy (km <sup>2</sup> )	Anomaly 2017	Anomaly 2018	Anomaly 2019	Anomaly 2020	Anomaly 2021	VI 2021
Mali	Bamako	200	-1.5σ (077%)	-1.5σ (078%)	-1.1σ (084%)	-1.2σ (082%)	-0.6σ (090%)	+0.04
	Gao	176422	+1.8σ (181%)	+1.3σ (157%)	+1.3σ (160%)	+0.0σ (101%)	+1.2σ (155%)	-0.14
	Kayes	121931	-0.4σ (096%)	-0.7σ (093%)	-0.0σ (100%)	-1.1σ (089%)	+1.1σ (111%)	+0.04
	Kidal	149277	+1.1σ (220%)	+1.5σ (255%)	+3.7σ (491%)	+0.5σ (151%)	+0.5σ (154%)	-0.32
	Koulikoro	89917	-0.0σ (100%)	-0.1σ (099%)	+0.6σ (105%)	-0.7σ (093%)	+1.2σ (111%)	+0.03
	Mopti	79584	+0.1σ (102%)	+0.4σ (107%)	+1.5σ (126%)	-0.3σ (095%)	+1.6σ (128%)	+0.03
	Segou	61972	+0.6σ (107%)	+0.2σ (103%)	+1.1σ (113%)	-0.4σ (096%)	+1.1σ (113%)	+0.02
	Sikasso	71877	-0.3σ (099%)	+0.2σ (101%)	-0.1σ (100%)	-0.2σ (099%)	+1.2σ (106%)	+0.02
	Tombouctou	498882	+1.3σ (147%)	+1.5σ (157%)	+1.5σ (157%)	-0.7σ (075%)	+1.7σ (162%)	-0.07
	Entire country	1257151	+0.1σ (101%)	+0.1σ (101%)	+0.7σ (106%)	-0.7σ (094%)	+1.4σ (113%)	-0.04
Mauritania	Adrar	220687	+0.3σ (152%)	-0.0σ (093%)	-0.4σ (021%)	-0.5σ (007%)	+0.1σ (112%)	-0.01
	Assaba	35239	-0.6σ (082%)	-1.1σ (066%)	+0.5σ (114%)	-1.7σ (050%)	+2.3σ (169%)	+0.07
	Brakna	32734	-0.9σ (050%)	-1.0σ (045%)	+0.2σ (111%)	-0.8σ (056%)	+1.8σ (199%)	+0.10
	Dakhlet-Nouadhibou	37920	-0.3σ (004%)	-0.3σ (016%)	-0.3σ (004%)	-0.3σ (004%)	+0.0σ (111%)	-0.02
	Gorgol	13812	-0.6σ (079%)	-1.3σ (057%)	+0.1σ (103%)	-0.9σ (072%)	+1.1σ (137%)	+0.09
	Guidimakha	10914	-0.2σ (096%)	-1.2σ (073%)	+0.4σ (109%)	-1.2σ (074%)	+2.3σ (151%)	+0.13
	Hodh Ech Chargi	182159	+1.4σ (151%)	+0.1σ (102%)	+0.8σ (128%)	-1.2σ (055%)	+1.4σ (151%)	-0.09
	Hodh El Gharbi	50287	-0.3σ (092%)	-1.1σ (066%)	+0.4σ (113%)	-2.0σ (041%)	+1.7σ (151%)	+0.05
	Inchiri	31504	-0.4σ (008%)	-0.1σ (077%)	-0.4σ (011%)	-0.4σ (000%)	+0.1σ (127%)	-0.04
	Nouakchott	1137	-0.4σ (039%)	-0.5σ (029%)	-0.5σ (031%)	-0.6σ (015%)	-0.1σ (088%)	-0.01
	Tagant	99789	-0.5σ (055%)	-0.7σ (035%)	+0.4σ (137%)	-0.9σ (020%)	+2.1σ (284%)	-0.10
	Tiris-Zemmour	258552	-0.2σ (019%)	-0.3σ (000%)	-0.3σ (000%)	-0.3σ (000%)	-0.0σ (099%)	-0.13
	Trarza	66032	-0.5σ (082%)	-0.8σ (070%)	+0.6σ (124%)	-0.4σ (085%)	+1.7σ (162%)	+0.04
	Entire country	1040397	+0.1σ (102%)	-0.9σ (075%)	+0.6σ (117%)	-1.6σ (055%)	+2.0σ (158%)	-0.01
Niger	Agadez	622088	+1.5σ (194%)	+1.7σ (202%)	+1.9σ (217%)	+0.5σ (133%)	+0.4σ (123%)	-0.28
	Diffa	145423	+1.6σ (135%)	+0.3σ (107%)	+1.6σ (137%)	+0.5σ (110%)	+1.5σ (132%)	-0.10
	Dosso	30935	+0.9σ (108%)	+1.6σ (114%)	+1.6σ (115%)	-0.7σ (093%)	-0.3σ (097%)	-0.04
	Maradi	38874	+1.7σ (129%)	+0.8σ (114%)	+0.7σ (112%)	-0.3σ (094%)	+0.7σ (111%)	-0.01
	Niamey	506	-0.4σ (093%)	-1.7σ (071%)	-0.3σ (095%)	-1.4σ (077%)	-0.6σ (091%)	-0.03
	Tahoua	107482	+0.7σ (119%)	+0.5σ (113%)	+1.5σ (138%)	+0.0σ (101%)	+0.7σ (117%)	-0.05
	Tillabéri	91413	+0.7σ (108%)	-0.4σ (095%)	+1.1σ (114%)	-0.5σ (094%)	-0.3σ (096%)	-0.10
	Zinder	146807	+2.0σ (145%)	+0.4σ (110%)	+1.1σ (125%)	+0.1σ (103%)	+0.6σ (114%)	-0.09
	Entire country	1187491	+1.6σ (125%)	+0.6σ (110%)	+1.5σ (123%)	-0.1σ (099%)	+0.6σ (109%)	-0.11
	Dakar	606	-2.1σ (065%)	-1.4σ (076%)	-0.2σ (097%)	-0.2σ (097%)	-0.7σ (088%)	+0.01
Senegal	Diourbel	4586	-0.1σ (098%)	-0.9σ (086%)	+0.4σ (106%)	-0.8σ (087%)	+0.8σ (113%)	+0.03
	Fatick	7080	-0.7σ (092%)	-1.7σ (081%)	+0.4σ (105%)	-0.3σ (096%)	+2.1σ (124%)	+0.07
	Kaffrine	10878	-0.9σ (087%)	-1.5σ (077%)	-0.1σ (098%)	-1.0σ (085%)	+1.1σ (117%)	+0.06
	Kaolack	5541	-0.3σ (096%)	-1.6σ (081%)	+0.3σ (104%)	-0.8σ (090%)	+2.5σ (131%)	+0.08
	Kedougou	16821	-1.0σ (092%)	-0.8σ (094%)	-0.4σ (097%)	-0.5σ (096%)	+1.1σ (108%)	+0.03
	Kolda	13778	-0.7σ (094%)	-1.4σ (088%)	-0.4σ (096%)	-1.0σ (091%)	+0.7σ (106%)	+0.04
	Louga	25653	-0.6σ (090%)	-0.6σ (089%)	+0.9σ (116%)	-0.7σ (088%)	+0.2σ (103%)	+0.01
	Matam	28560	-0.8σ (084%)	-1.6σ (067%)	-0.3σ (095%)	-1.1σ (078%)	+0.8σ (117%)	+0.08
	Saint Louis	19615	-0.2σ (096%)	-0.9σ (077%)	+1.0σ (124%)	-0.1σ (097%)	+0.5σ (112%)	+0.01
	Sedhiou	7398	-0.5σ (096%)	-1.5σ (089%)	-0.5σ (096%)	-0.5σ (096%)	+2.0σ (115%)	+0.05
	Tambacounda	43144	-0.7σ (091%)	-1.3σ (084%)	-0.2σ (097%)	-1.0σ (087%)	+1.4σ (118%)	+0.07
	Thies	6924	-1.0σ (089%)	-0.7σ (091%)	+1.2σ (115%)	+0.3σ (104%)	+0.8σ (109%)	+0.01
	Ziguinchor	7592	-0.7σ (095%)	-1.5σ (089%)	-0.1σ (099%)	+0.9σ (107%)	+2.5σ (119%)	+0.06
	Entire country	198320	-0.8σ (092%)	-1.4σ (085%)	+0.0σ (100%)	-0.8σ (091%)	+1.3σ (114%)	+0.05
Chad	Barh-El-Gazel	49876	+1.4σ (144%)	+0.3σ (108%)	+1.4σ (142%)	-0.7σ (080%)	+1.4σ (143%)	-0.03
	Batha	90543	+0.7σ (118%)	+0.7σ (117%)	+1.5σ (135%)	+0.0σ (100%)	+1.7σ (142%)	+0.05
	Borkou	149318	+0.2σ (116%)	+0.2σ (117%)	+2.1σ (289%)	+0.5σ (145%)	+1.1σ (204%)	-0.26
	Chari-Baguirmi	46298	+0.2σ (102%)	+1.7σ (117%)	+0.7σ (107%)	-0.6σ (094%)	+0.7σ (107%)	+0.00
	Ennedi Ouest	123959	+0.5σ (141%)	+0.6σ (157%)	+1.1σ (200%)	+0.3σ (128%)	+0.6σ (154%)	-0.25
	Ennedi-Est	83306	+1.3σ (219%)	+1.2σ (212%)	+2.1σ (286%)	+0.3σ (124%)	+1.0σ (189%)	-0.24
	Guera	60921	+0.1σ (101%)	+1.0σ (109%)	+0.1σ (101%)	-1.0σ (091%)	+0.9σ (108%)	+0.02
	Hadjer-Lamis	29085	+1.6σ (123%)	+0.9σ (113%)	+1.7σ (125%)	-0.2σ (096%)	+1.0σ (115%)	-0.00
	Kanem	72851	+1.6σ (154%)	+0.0σ (100%)	+1.7σ (156%)	-0.6σ (079%)	+2.0σ (168%)	-0.01
	Lac	21746	+1.4σ (117%)	+0.9σ (110%)	+1.8σ (121%)	+0.9σ (111%)	+1.5σ (117%)	+0.01
	Logone Occidental	8640	-0.9σ (094%)	+0.9σ (106%)	-1.4σ (091%)	-2.0σ (087%)	-1.7σ (088%)	-0.02
	Logone Oriental	23840	-1.3σ (095%)	+1.5σ (106%)	-0.6σ (097%)	-1.8σ (092%)	-0.5σ (098%)	-0.00
	Mandoul	17388	-1.2σ (094%)	+0.8σ (104%)	-0.6σ (097%)	-1.8σ (092%)	-0.0σ (100%)	+0.00
	Mayo Kebbi Est	18395	-0.8σ (094%)	+1.4σ (112%)	-1.0σ (092%)	-2.0σ (084%)	-0.3σ (098%)	-0.00
	Mayo-Kebbi Ouest	12551	-0.4σ (097%)	+1.5σ (111%)	-1.7σ (088%)	-2.2σ (084%)	-0.9σ (094%)	-0.01
	Moyen-Chari	40810	-0.7σ (096%)	+1.1σ (107%)	-0.6σ (097%)	-1.4σ (092%)	+1.2σ (107%)	+0.02
	N'Djamena	471	+0.3σ (104%)	+0.9σ (113%)	+0.7σ (110%)	-1.2σ (082%)	-0.7σ (090%)	-0.04
	Ouaddai	29689	+0.5σ (109%)	+1.0σ (117%)	+1.3σ (121%)	-0.0σ (100%)	+1.5σ (126%)	+0.04
	Salamat	68151	-0.6σ (095%)	+0.8σ (107%)	-0.2σ (098%)	-1.7σ (085%)	-0.1σ (099%)	+0.00
	Sila	36285	+0.1σ (101%)	+1.8σ (119%)	+0.6σ (107%)	-0.8σ (091%)	+0.4σ (105%)	+0.00
Tandjile	17850	-0.8σ (095%)	+1.0σ (107%)	-1.1σ (093%)	-2.1σ (086%)	-0.9σ (094%)	-0.01	
Tibesti	210958	+0.3σ (134%)	+4.5σ (671%)	-0.2σ (080%)	-0.6σ (025%)	-0.1σ (086%)	-0.21	
Wadi Fira	52068	+0.7σ (126%)	+0.5σ (120%)	+1.6σ (159%)	+0.2σ (108%)	+1.1σ (141%)	+0.05	
Entire country	1272128	+0.1σ (101%)	+1.3σ (110%)	+0.6σ (104%)	-1.2σ (091%)	+0.9σ (107%)	-0.01	



## RAINFALL CONTEXT

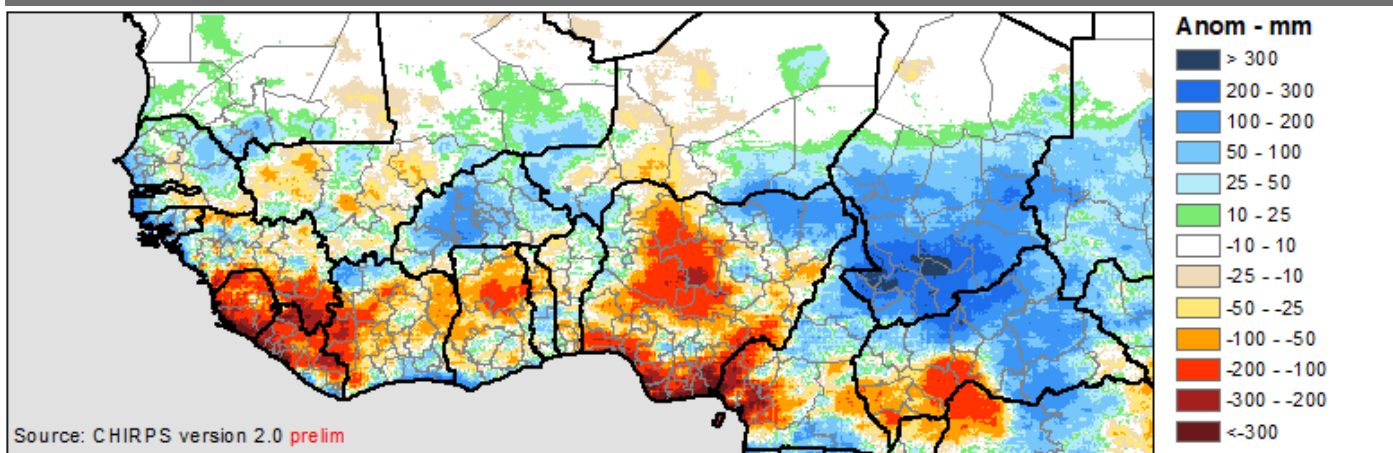
Although water availability is the limiting parameter for vegetation growth in the Sahel, it is the distribution of rainfall over time that is crucial and will determine the annual production of biomass. The annual accumulation cannot alone explain the anomaly in biomass production.

Map 6 shows the cumulative rainfall derived from satellite imagery over the 2022 rainy season (May to August) by the United States Geological Survey (USGS). This map shows a positive situation over the

whole Sahelian zone except for southwest Mauritania, southern Mali and central Niger which are slightly below normal cumulative rainfall.

Map 7 shows the rainfall forecast for September 2022 by the National Oceanic and Atmospheric Administration's Climate Prediction Center CPC. This map shows a positive anomaly at the end of the 2022 rainy season over the entire Sahel, with good rainfall suggesting positive biomass production at the end of the season.

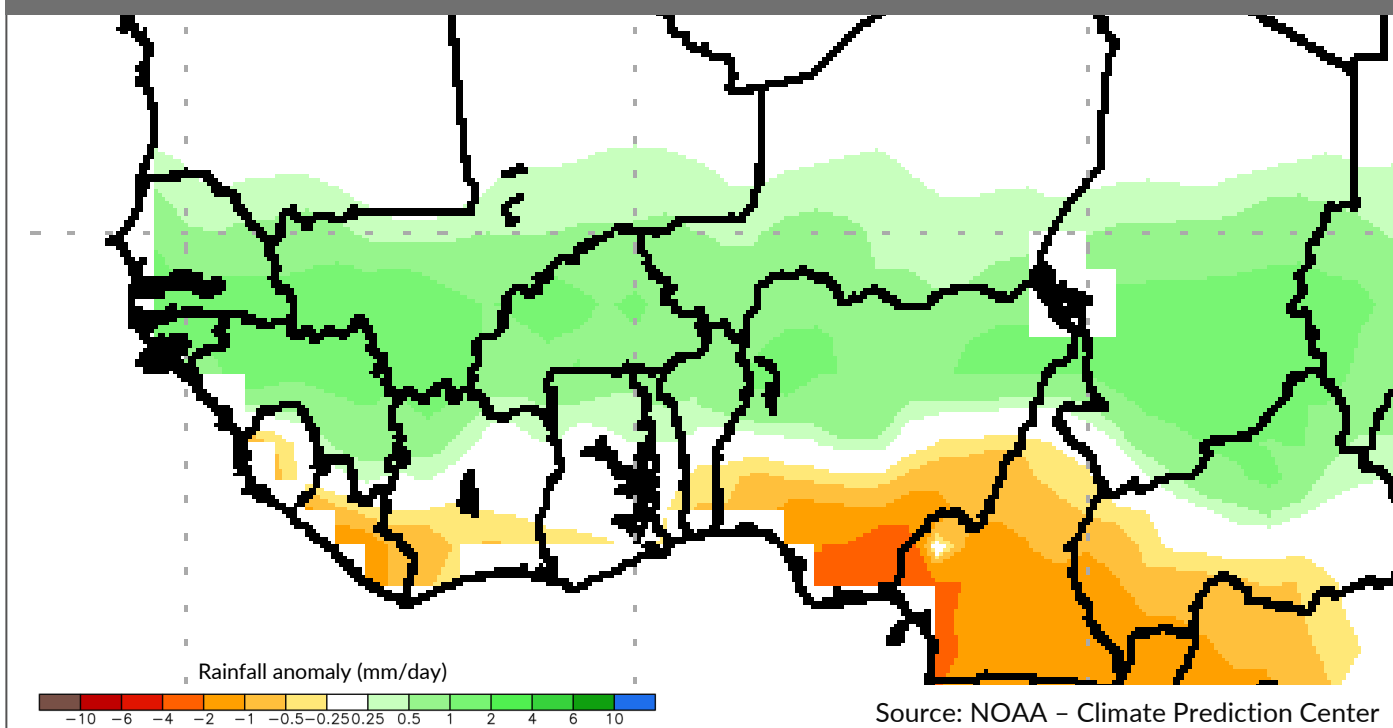
**MAP 6: RAINFALL ANOMALIES MAY-SEPTEMBER 2022 (USGS)**



Map produced by USGS/EROS



**MAP 7: RAINFALL FORECAST FOR SEPTEMBER 2022 (NOAA-CPC)**



## CONCLUSION

### WINTERING SEASON 2022

At mid-season, the 2022 rainy season appears to be very good overall over West Africa and the Sahel, despite some contrasts observed in the western and central Sahel. Indeed, at the scale of the area covered, the biomass production anomaly is generally positive.

The best biomass productions are recorded in central and southern Senegal, south-eastern Mauritania, southern and south-eastern Mali, almost all of Burkina Faso, central Chad, and the Extreme North region of Cameroon.

Despite this good production, deficits are observed. The areas concerned are northern Senegal, southwestern Mauritania, almost all of Niger and southern Chad, which have negative to strongly negative normalized biomass production anomalies.

Despite the dry spells at the beginning of the season, the evolution of biomass production shows a favourable trend. The negative anomalies may still improve with good rainfall expected for the rest of the season.

The low production areas also remain vulnerable as they follow a less productive winter of 2021. Overall, it is the Tri-border region that is recording both negative production anomalies and alarming negative vulnerability indices. It is feared that this

deficit in biomass production will degrade the livelihoods of the area's populations, which are already subject to a highly degraded security context.

The coastal countries, in particular Nigeria as a whole and particularly the central-eastern part of the country, Benin, Togo, and northern Côte d'Ivoire, are in a worrying situation with biomass production, including fodder and agricultural production, in sharp decline during the first half of the growing season. However, in comparison with the Sahelian countries, the vulnerability of these coastal countries to a biomass production deficit is usually lower.

At the same time, the mid-season is also marked by above-average runoff with a significant rise in river levels in the Sahelian strip. In the more anthropised environments with less adapted facilities, significant flooding was observed. In rural areas, heavy flooding may have affected agricultural production and livestock.

The behaviour at the end of the rainy season will be decisive for the precise measurement of biomass production. To this end, forecasts show a positive trend for the entire region, marked by a late end of the season and excess rainfall compared to the average for the decade.

## RECOMMENDATIONS

- Follow the general recommendations in favour of the pastoral and agro-pastoral sectors:
  - Advocacy for the recognition of the importance of transhumant livestock for the functioning of the Sahelian agrarian system
  - Facilitation of pastoral mobility
  - Development of services for herders and flocks (animal health, vaccination, etc.)
  - Improvement of pastoral infrastructures that should be considered as priorities for the stability and socio-economic development of the countries concerned by the monitoring system
- Consult the ACF Biomass Early Warning Guide available at [www.sigsahel.info](http://www.sigsahel.info)
- Carry out regular monitoring during the late winter season in targeted vulnerable areas in south-west Mauritania, northern Senegal and the entire Tri-border region, particularly eastern Niger
- Monitor agricultural production areas where low biomass production has been measured
- Monitor riverine agricultural areas that have been impacted by flooding following heavy rainfall, particularly on the Senegal River and in the interior Niger delta



The data used for the calculation of biomass production comes from the data generated by the COPERNICUS ground 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.

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