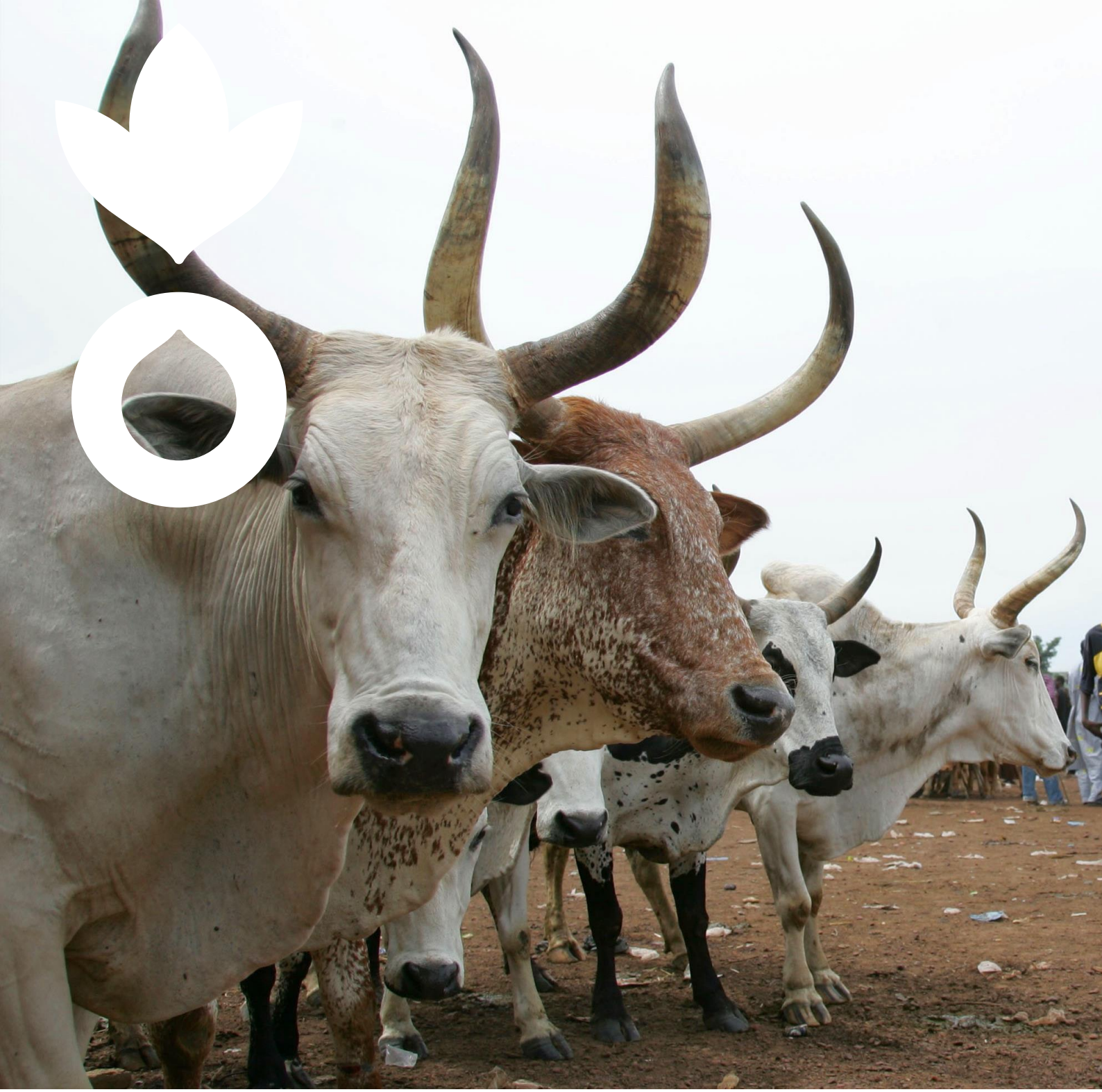

BIOMASS PRODUCTION IN 2021 ANALYSIS AND OUTLOOK FOR 2022

SAHEL REGIONAL REPORT

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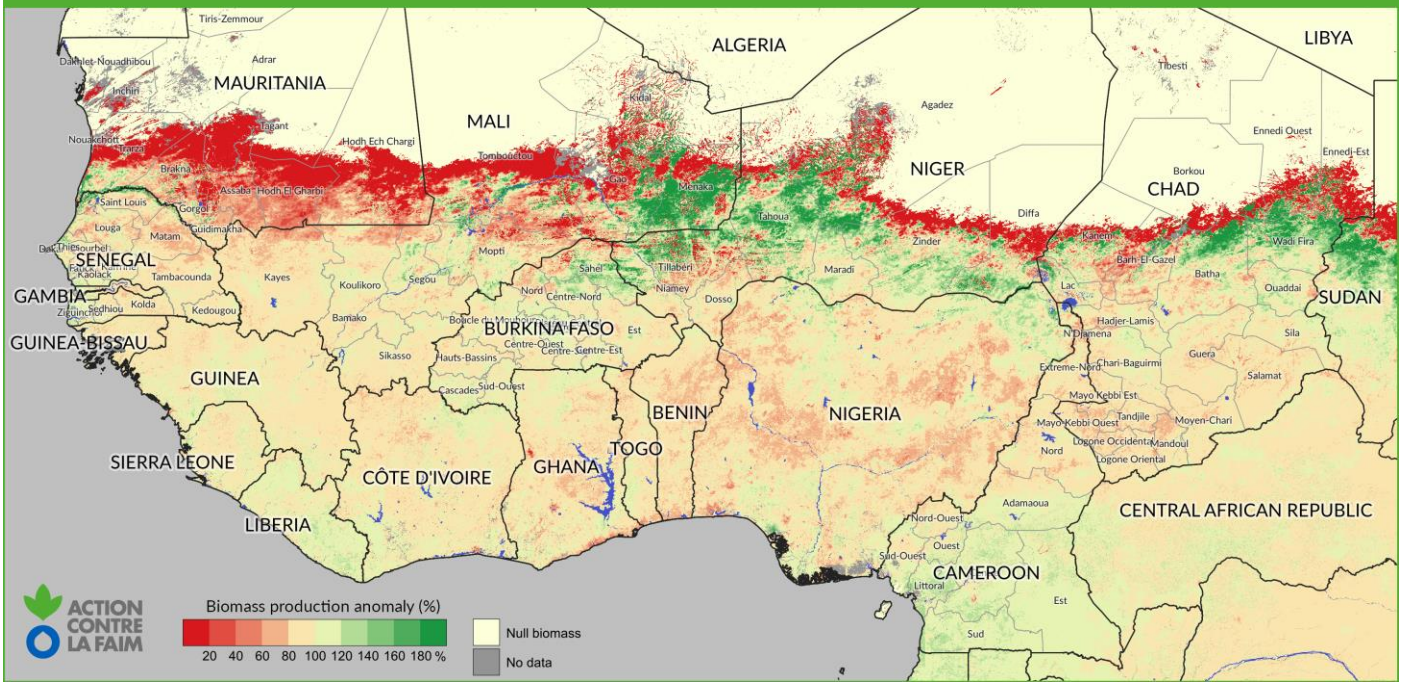
ERWANN FILLOL

ACTION AGAINST HUNGER
ACTION CONTRE LA FAIM

MAP 1: ANOMALY OF BIOMASS PRODUCTION FOR YEAR 2021 IN PERCENT



HIGHLIGHTS

- Rainy season globally close to normal in the Sahel
- Biomass production close to normal in almost all of the Sahelian area
- Negative biomass production in pastoral areas of Mauritania, in the Tagant, Assaba, Guidimakha and Gorgol regions
- Strongly negative biomass production in Mauritania and moderately negative in the Timbuktu region of Mali
- Critical biomass production deficits in Hodh El Chargui and Hodh El Gharbi in Mauritania
- Negative biomass production especially in the northern pastoral zone of Niger and Chad
- Economic environment remains challenging
- Security context severely hampering herd mobility and access to pasture and water resources in the Central Sahel

INTRODUCTION

Overall, biomass production in the Sahel for the 2021 season shows a clear deterioration compared to 2020 levels, which were considered exceptional. The season is close to normal in the south of the Sahel zone.

Critical negative anomalies are recorded over Mauritania in the wilayas of Hodh El Chargui and Hodh El Gharbi and the northern part of the wilayas of Asaba, Gorghol, Tagant and Guidimakha. The biomass vulnerability index illustrates the repetition of negative production in recent years.

In Mali, the Timbuktu region has seen a sharp contrast in production, with pockets of very marked deficits in the northwestern part of Goundham, in Timbuktu itself and in Gourma Rahous. These deficits pose a risk of an early and long lean season for communities already suffering from insecurity.

For the northern Sahelian zone as a whole, negative anomalies are observed, which should result in a relatively early pastoral lean season in 2022. However, if herd mobility is not hindered, herders should be able to find pasture.

The positive anomaly areas of northern Burkina Faso, Menaka in Mali and some communes of Tahoua and Tillabéri in Niger are also areas affected by insecurity and where the mobility of herds and people to access resources is currently severely hampered.

SYSTEM DESCRIPTION

WHAT IS BIOMASS AND HOW IS IT MEASURED?

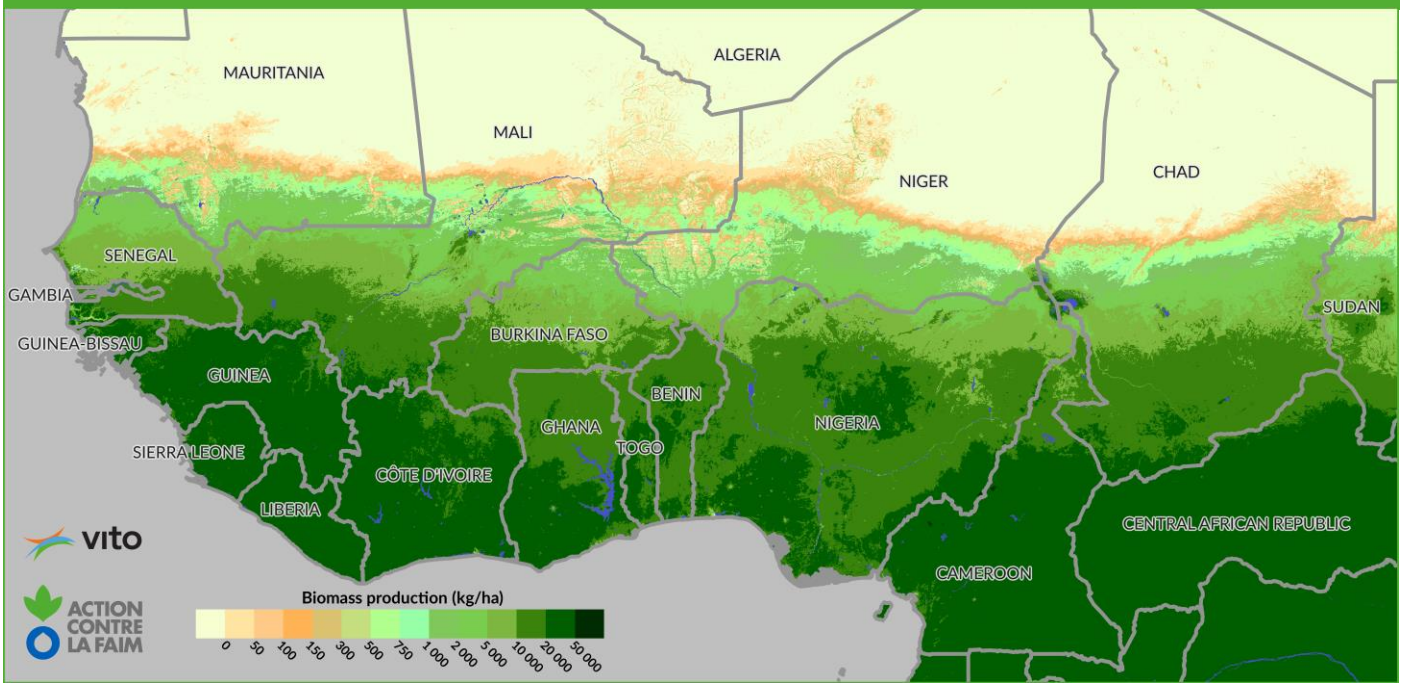
Biomass is the total production of vegetal material measured in kilograms of dry matter MS per hectare kg/ha. The term dry matter is used to describe any form of vegetation above the ground regardless of its water content. For an analysis of the pastoral situation, biomass is an effective way of measuring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

The method of 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 that of the satellite archive from 1999 to the present.

MAP 2: AVERAGE ANNUAL BIOMASS PRODUCTION 1999-2021



WHAT INDICATORS ARE GENERATED?

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

- Annual production kg/ha

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

- Anomaly expressed as a percentage of the mean value
- Standard deviation expressed as number of standard deviations σ of deviation from the mean

A vulnerability index linked to biomass availability, called 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 the details of BioGenerator's operation are available at : www.sigsahel.info/index.php/section/tele/

BIOMASS PRODUCTION IN 2021

MAPPING OF THE BIOMASS PRODUCTION ANOMALY

Map 1 shows the biomass production anomaly for 2021 on the Sahel expressed as a % of the mean, and Map 3 shows this same production anomaly but expressed as a number of standard deviation σ from the mean called normalized anomaly.

These maps show contrasting biomass production in 2021, between areas with a clear deficit, particularly in Mauritania and Mali, and areas with a positive balance, particularly in Niger and Chad. Local variability can be significant.

In south-eastern and central Mauritania, in the wilayas of Tagant, Hodh El Gharbi, Hodh El Chargui, Assaba, Guidimakha and Gorgol but also in parts of Brakna and Trarza, production is below normal, and within a highly unusual range of variation despite high interannual variability in these areas.

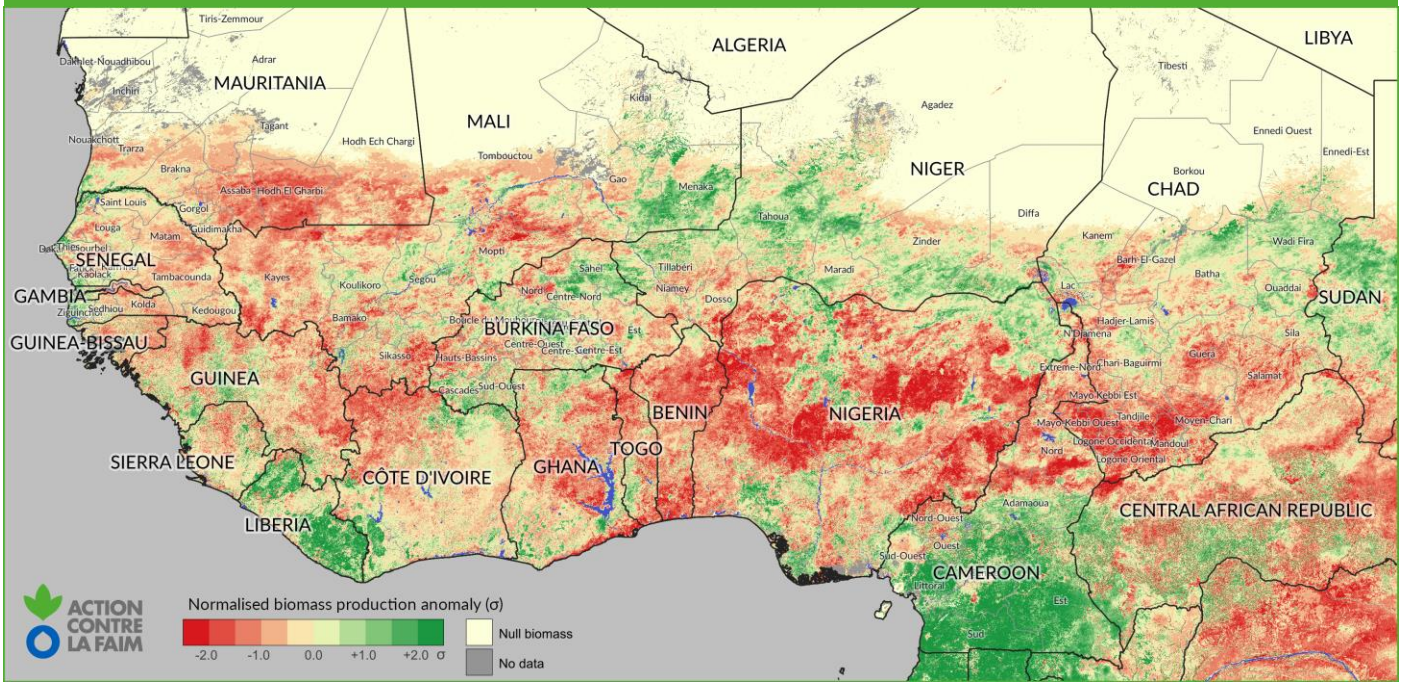
The normalized anomaly allows us to qualify the observation on the predominantly pastoral livelihood zones in the north of the region: although the negative anomalies in relation to the average are marked, these are zones subject to high variability and in which the quantitative levels of production are low. However, these pastures are considered to be of high quality by herders and the overall situation remains negative in these areas.

In the central Sahel, particularly in northern Burkina Faso, north of Tillabéry and Tahoua in Niger, and in Ménaka in Mali, the anomalies are positive, but the local security context makes access to resources difficult.

In the southern parts of the West Africa region, which are predominantly agricultural, there are marked negative anomalies that reflect the pockets of drought recorded during the season in 2021.

These anomalies in biomass production in 2021 compared to previous years are further illustrated by analyses of seasonal and interannual variability in biomass.

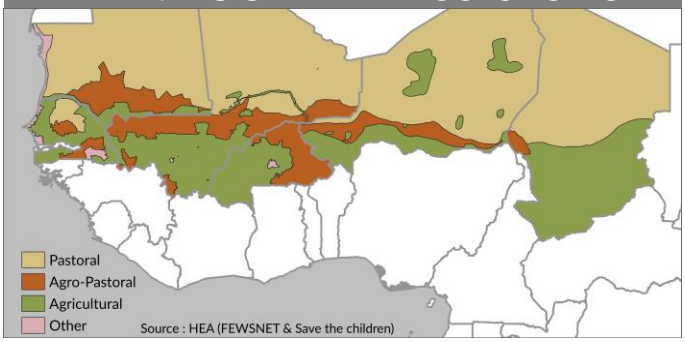
MAP 3: NORMALISED BIOMASS PRODUCTION ANOMALY YEAR 2021



INTERANNUAL VARIATIONS IN BIOMASS PRODUCTION

Based on the breakdown by livelihood zones, it is possible to observe the inter-annual variation in biomass production according to land use: agricultural and agropastoral.

MAP 4: REGIONAL LIVELIHOODS ZONES



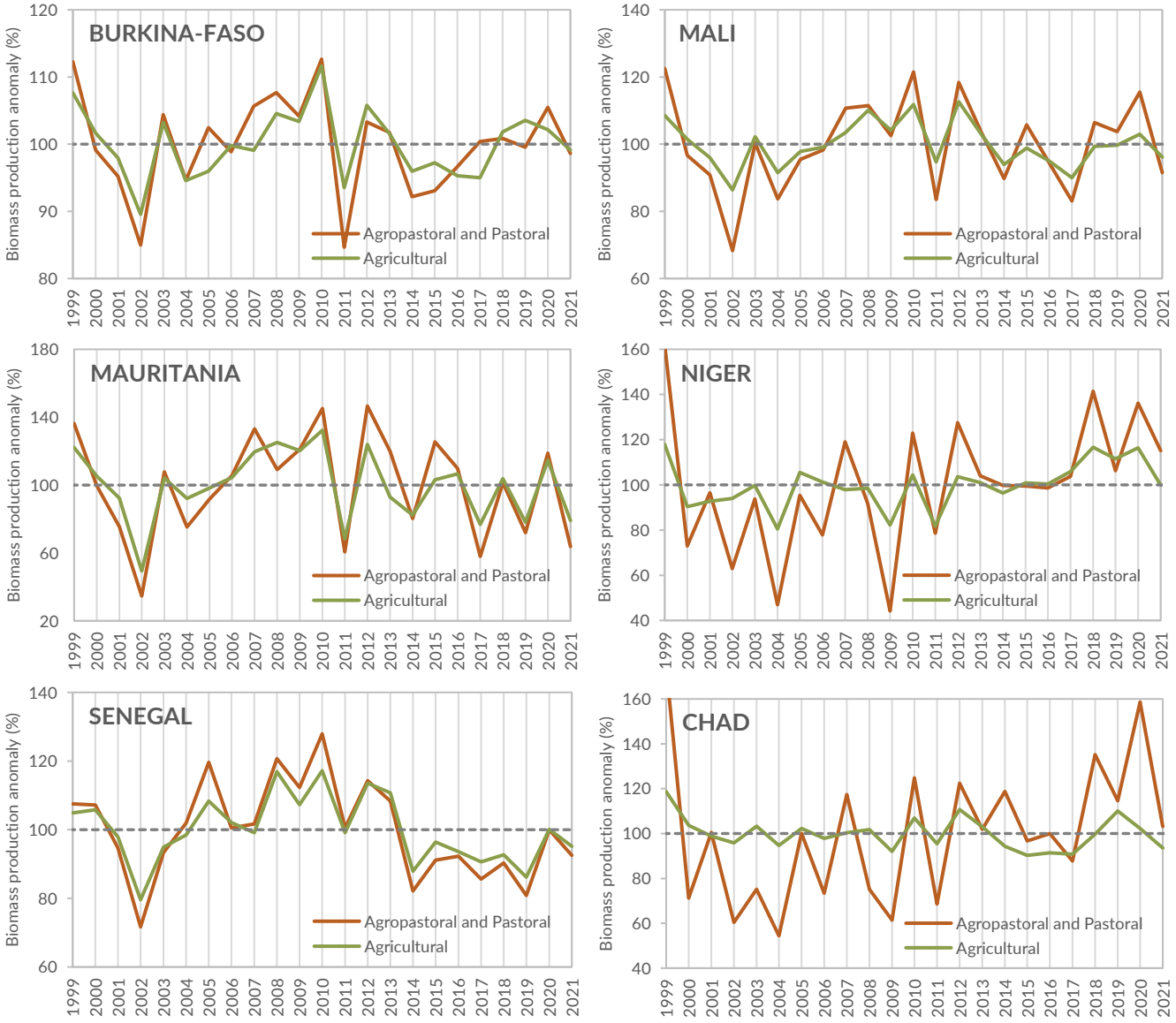
For the elaboration of these comparisons, the initial agropastoral and pastoral classes are combined in order to obtain statistics on the dominantly pastoral use area.

The graphs show a year 2021 that is regressing everywhere compared to 2020 and below average in Senegal, Mauritania and Mali.

Production for 2021 is expected to be close to or above the 1999-2021 average in the agropastoral and pastoral areas of Burkina Faso, Chad and Niger.

From an overall point of view, biomass production in agricultural areas is close to normal everywhere, reflecting a less contrasted wintering season in these areas.

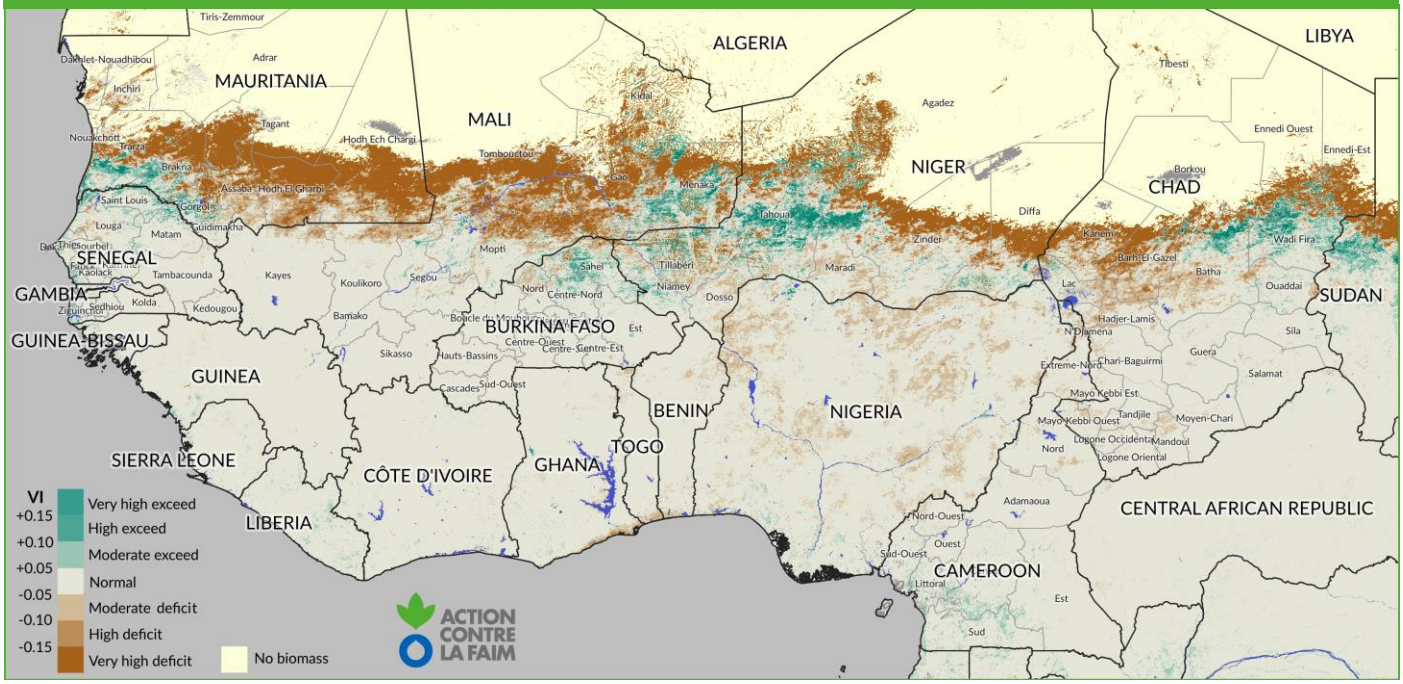
In Mauritania, the negative variation is strongly marked for the two types of zones distinguished here, and the graphs highlight the strong variations recorded over the past 10 years. The 2021 levels are close to those of 2011, 2017 or 2019, years followed by early and long pastoral lean periods for pastoralists.



COMPARISON OF 2021 WITH RECENT YEARS

The biomass vulnerability index VI, shown on Map 5, is sensitive to variations in production in recent years and highlights areas with successive biomass deficits. While the majority of the Sahelian zone has a normal vulnerability index, Mauritania and the northern regions of the Sahelian band have a negative index due to the repetition of low production years: 2017, 2019 and 2021.

MAP 5: BIOMASS VULNERABILITY INDEX 2021



The following table shows the anomalies in biomass production, expressed as the number of standard deviations from the mean and as a % of the mean, for the six countries monitored over the agricultural and agropastoral use areas.

This table shows an overall negative situation for the year 2021, with a clear deterioration compared to 2020.

The deterioration in 2021 is particularly marked in Mauritania, but also in the agropastoral and pastoral areas of Mali, Senegal and Chad.

Although 2020 was an exceptional year, most countries are still suffering from the impact of the lower production years that have dominated the past 5 years.

		Anomaly 2017	Anomaly 2018	Anomaly 2019	Anomaly 2020	Anomaly 2021	VI 2021
Burkina-Faso	Agropastoral and Pastoral	+0.1σ (100%)	+0.1σ (101%)	-0.1σ (100%)	+0.8σ (105%)	-0.2σ (099%)	+0.00
	Agricultural	-1.0σ (095%)	+0.4σ (102%)	+0.7σ (104%)	+0.4σ (102%)	-0.2σ (099%)	-0.00
Mali	Agropastoral and Pastoral	-1.2σ (083%)	+0.5σ (106%)	+0.3σ (104%)	+1.1σ (115%)	-0.6σ (091%)	-0.14
	Agricultural	-1.5σ (090%)	-0.1σ (099%)	-0.0σ (100%)	+0.4σ (103%)	-0.6σ (096%)	-0.01
Mauritania	Agropastoral and Pastoral	-1.4σ (058%)	+0.0σ (101%)	-0.9σ (072%)	+0.6σ (119%)	-1.2σ (064%)	-0.24
	Agricultural	-1.1σ (077%)	+0.2σ (104%)	-1.1σ (078%)	+0.7σ (115%)	-1.0σ (079%)	-0.05
Niger	Agropastoral and Pastoral	+0.1σ (104%)	+1.5σ (141%)	+0.2σ (106%)	+1.3σ (136%)	+0.5σ (115%)	+0.01
	Agricultural	+0.6σ (106%)	+1.6σ (117%)	+1.1σ (112%)	+1.6σ (116%)	-0.0σ (100%)	-0.06
Senegal	Agropastoral and Pastoral	-1.0σ (086%)	-0.7σ (090%)	-1.4σ (081%)	-0.0σ (100%)	-0.5σ (093%)	-0.12
	Agricultural	-1.0σ (091%)	-0.8σ (093%)	-1.4σ (086%)	+0.0σ (100%)	-0.5σ (095%)	+0.01
Chad	Agropastoral and Pastoral	-0.4σ (088%)	+1.1σ (135%)	+0.5σ (115%)	+1.9σ (159%)	+0.1σ (103%)	-0.18
	Agricultural	-1.3σ (091%)	-0.0σ (100%)	+1.4σ (110%)	+0.3σ (102%)	-0.9σ (094%)	-0.01

RAINFALL CONTEXT

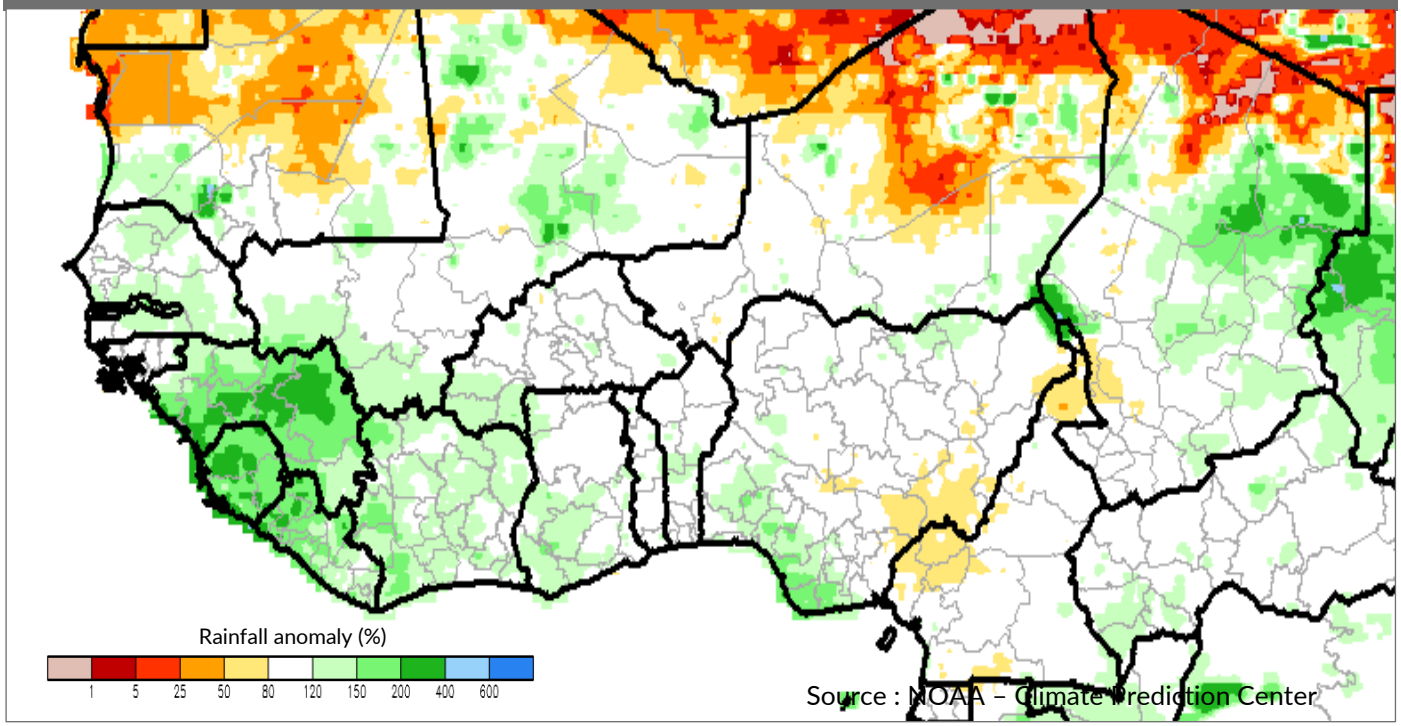
Although water is the limiting parameter for vegetation growth in the Sahelian zone, it is also the distribution of rainfall that impacts the regeneration of vegetation and pastures.

Maps 6 and 7 show rainfall totals derived from satellite imagery over the 2021 rainy season. The maps are derived from two separate sources: NOAA-Climate Prediction Center and United States Geological Survey USGS. These two anomalous precipitation maps present sometimes divergent data but give an overview of the rainy season.

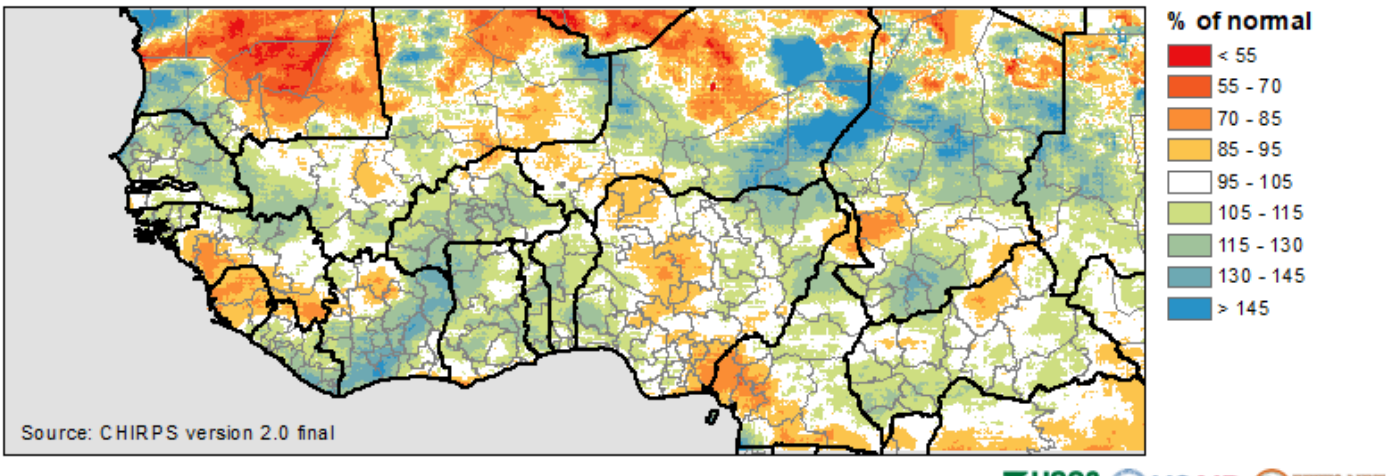
The year 2021 is close to normal over the whole Sahel in terms of rainfall with above normal values around the Lake Chad Basin and in the North East of Chad.

These maps illustrate the impacts of rainfall distribution on biomass production: in 2021, despite near-normal total rainfall, the temporal distribution of rainfall had a strong negative impact on biomass growth in Mauritania and Mali in particular.

MAP 6: RAINFALL ANOMALIES MAY-OCTOBER 2021 (NOAA-CPC)



MAP 7: RAINFALL ANOMALIES MAY-SEPTEMBER 2021 (USGS)



CONCLUSION

WINTERING SEASON 2021

The 2021 winter season was much less productive than the 2020 season, which was marked by exceptional biomass production in most Sahelian countries. The significant deficits in Mauritania and northwest Mali point to an earlier and longer pastoral lean season than last year. These deficits follow several difficult years, and the biomass vulnerability index illustrates the difficult situation in the north of the entire Sahelian band. There are, however, areas of surplus production in some regions of Niger, Burkina Faso and Mali, but these areas are marked by an extremely deteriorated security context, which is causing considerable disruption of pastoral mobility.

Already in 2020, despite the good wintering season, the annual biomass report highlighted that the western part of the subregion was still suffering from the accumulation of deficits recorded in previous years. The strong negative anomalies recorded in this geographical area this year will have significant consequences on communities and their herds and on the seasonality of movements: early pastoral lean season, early movements and longer stays in areas offering good availability primarily in the south of the subregion.

The central Sahel is still facing security challenges and the situation is having a strong negative impact on the mobility of pastoralists, their access to pasture and, ultimately, the renewal of their livelihoods.

Furthermore, the context in the Sahel is not changing much for the pastoral sector. A recent report commissioned by the Réseau Billital Maroobé (RBM – a regional pastoralist network) shows that the progressive monopolisation of pastoral resources (land, water points) by other actors continues; that pastoralists remain overexposed to various types of abuse (administrative procedures, theft, extortion); that the rise of inequalities among pastoralists continues with the appearance of "new pastoralists" (urban people investing in the sector or farmers diversifying their activities through the acquisition of large herds) and finally that the political economy of land remains very unfavourable to pastoralists.

This end-of-season assessment provides a complete picture of the apparent availability of biomass, a key resource for the management of livestock systems in the sub-region. However, regular monitoring of the biomass stock and the situation of the herds remains key to anticipating possible difficulties related to early movements, bush fires and mobility restrictions to name a few.

OUTLOOK FOR 2022

In the western part of the subregion, the outlook for 2022 is poor. The negative impact of the apparent low fodder availability in Mauritania and Mali will be felt early in 2022, and it is necessary to plan now for the response that will be needed to support communities in areas where deficits have been recorded and in areas where early displacement is anticipated. General support measures should focus on destocking, fodder and feed supply and veterinary support.

In the rest of the subregion, the outlook for 2022 is close to normal based on the apparent availability of biomass at the end of the 2021 rainy season.

It is important to maintain and strengthen pastoral monitoring systems in the field because they complement the assessments obtained via satellite imagery and provide information on the evolution of key indicators (prices, animal concentration, state of health and animal overweight, mobility restrictions, etc.) to identify and locate difficulties and prepare a response within an appropriate timeframe.

Pastoral and agropastoral production systems in the region are still permanently weakened by the cumulative effects of anthropogenic shocks (insecurity and conflicts in the first place) and epidemiological shocks (the recent COVID 19 pandemic and the impact of the sanitary measures decreed to deal with it). The women, children and men who depend on this sector must be at the heart of programmes to support agricultural and rural communities.

Support for the collective management of shared territories and commons remains a priority in all areas of the sub-region. In the same way, technical support for the transformation of practices for the preservation of pastoral resources is essential to

strengthen the efforts made on the rules of access, use and utilization of territories.

In close partnership with herders' and pastoralists' organizations, it is important to develop and implement technical innovations related to pastoral resource management such as locally adapted fodder production and holistic management.

RECOMMENDATIONS

- Consult ACF's Early Warning Guide on biomass available on www.sigsahel.info
- Carry out regular monitoring during the off-season in vulnerable target areas in Mauritania, Senegal and Mali
- Integrate support to the pastoral sector at the heart of intervention strategies in the sub-region
- Involve the various stakeholders in the development and sustainability of the pastoral sector:
    - Revaluation of the pastoral sector
    - Strengthening public livestock services and pastoral organizations
    - Improvement of pastoral infrastructures
    - Veterinary support and livestock vaccination

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.

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