



# **BIOMASS PRODUCTION IN 2020 ANALYSIS AND OUTLOOK FOR 2021**

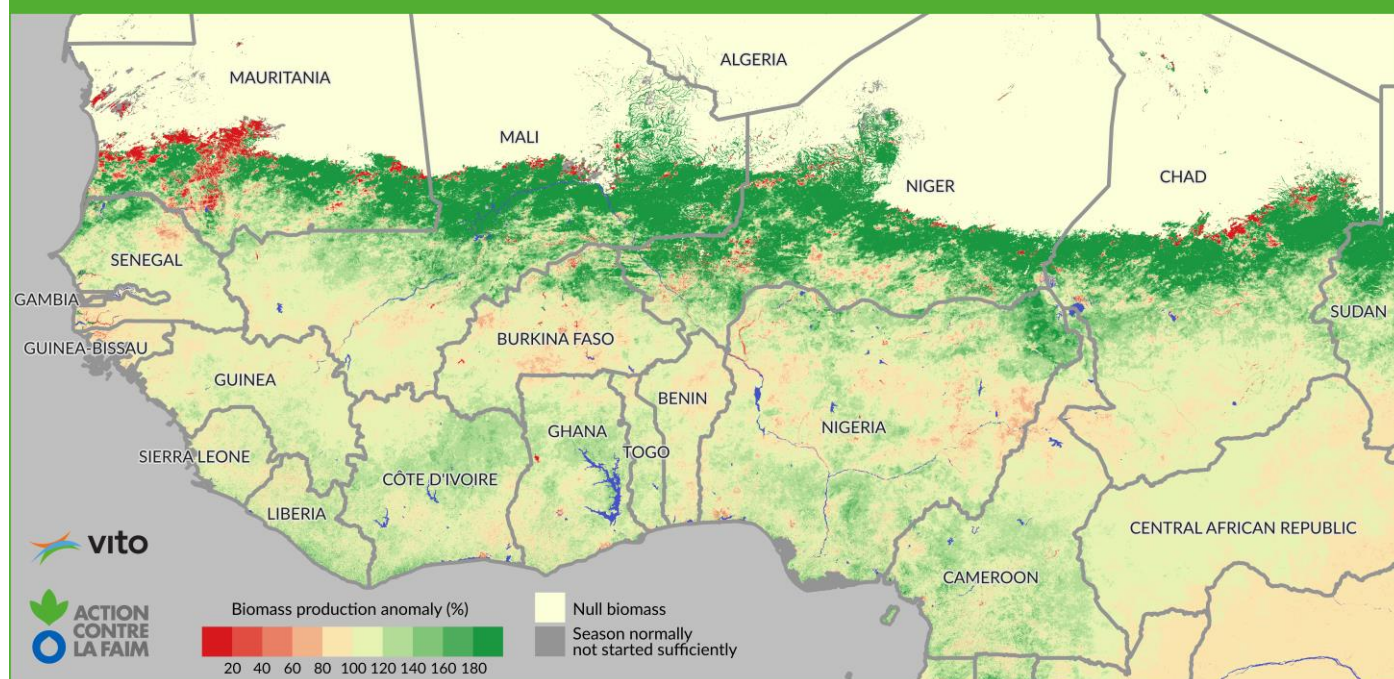
## **SAHEL REGIONAL REPORT**

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**ACTION  
AGAINST  
HUNGER**  **ACTION  
CONTRE  
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MAP 1: ANOMALY OF BIOMASS PRODUCTION FOR YEAR 2020 IN PERCENT



## KEY POINTS

- Positive rainy season in the Sahel
- Surplus of biomass production compared to the normal over almost the entire Sahelian zone
- Locally negative biomass production in Western Mauritania, in the regions of Tagant, Brakna and Trarza
- Locally moderately negative biomass production in the Matam region of Senegal
- Deficits in biomass production quite critical in the Boucle du Mouhoun, Central West, Central Plateau and Central East regions
- Negative biomass production in isolated enclaves especially in the northern pastoral zone of Barh-El-Gazel, Batha and Ennedi-Est
- Difficult economic context due to the sanitary measure and associated restrictions following the COVID-19 pandemic
- Security context severely hindering herd mobility and access to pasture and water resources in the Central Sahel

## INTRODUCTION

Overall, biomass production in the Sahel for the 2020 campaign shows a clear improvement from 2019 levels. The season was positive in the Sahel and vegetation benefited from abundant rains.

Negative anomalies persist over western Mauritania in the Tagant, Brakna and Trarza regions and, to a lesser extent, in the Matam region of Senegal.

In Burkina Faso the Boucle du Mouhoun, Centre West, Central Plateau and Centre East regions have recorded significant production deficits. This poses a

risk of an early and long lean season for communities already struggling with insecurity and restrictions in the fight against the COVID-19 pandemic.

Everywhere else, positive anomalies are observed that should result in a shorter pastoral hunger gap in 2021. If herder's mobility is not impeded, pastoralists should be able to find pasture. However, in areas of conflict or banditry which are increasing sharply in the Sahel region (Burkina Faso, Niger - Tillabéry, Tahoua, Diffa - and Mali - Gao, Mopti), this may be less obvious.

## SYSTEM DESCRIPTION

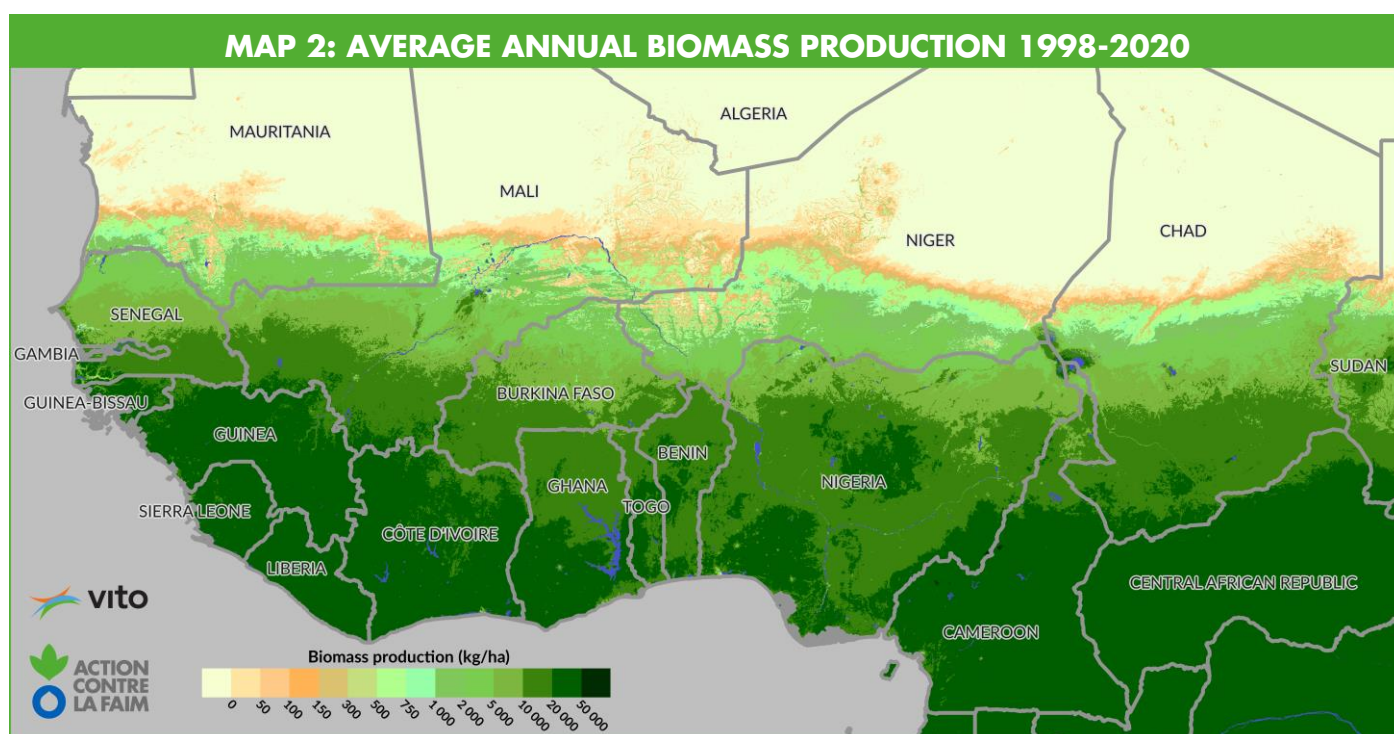
### WHAT IS BIOMASS AND HOW IS IT MEASURED?

Biomass is the total production of vegetation matter measured in kilograms of dry matter DM per hectare kg/ha. The term dry matter is used to describe any form of vegetation above the ground regardless of its moisture content. For a pastoral situation analysis, biomass is an effective means of measuring the availability of pasture resources.

Biomass production is calculated from satellite images collected every day by the European Space Agency's **SPOT-VEGETATION** and **PROBA-V** satellites and provided by ACF's scientific partner, the Flemish Institute of Technology **VITO**, through the European **COPERNICUS** 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 radiation.

The **BioGenerator** tool developed by ACF makes it possible to integrate all these data in order to produce the annual biomass production map calculated over the growing season corresponding to the rainy season in the Sahel. The spatial resolution is 1 km, which is consistent the spatial resolution of the satellite-based products in use. The period covered is that of the satellite archive from 1998 to the present.



### 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 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 average value %**
- **Normalized abnormality expressed as the number of standard deviations  $\sigma$  from the mean**

A vulnerability index linked to the availability of biomass VI is calculated recursively by weighting the most recent years in order to take into account dry or rainy sequences of events:

- **Vulnerability index VI**

The methods used and details of functioning of BioGenerator can be found at: [www.sigsahel.info](http://www.sigsahel.info).



## BIOMASS PRODUCTION IN 2020

### MAPPING OF THE BIOMASS PRODUCTION ANOMALY

Map 1 shows the biomass production anomaly for 2020 in the Sahel expressed as a % of the mean, and map 3 shows the same production anomaly but expressed as the number of standard deviations  $\sigma$  from the mean called the normalised anomaly.

These maps show excess biomass production in 2020, everywhere well above the average, particularly in the pastoral areas of Mali, Niger, Chad, eastern Mauritania and northern Burkina Faso.

Nevertheless, some localised areas show biomass deficits:

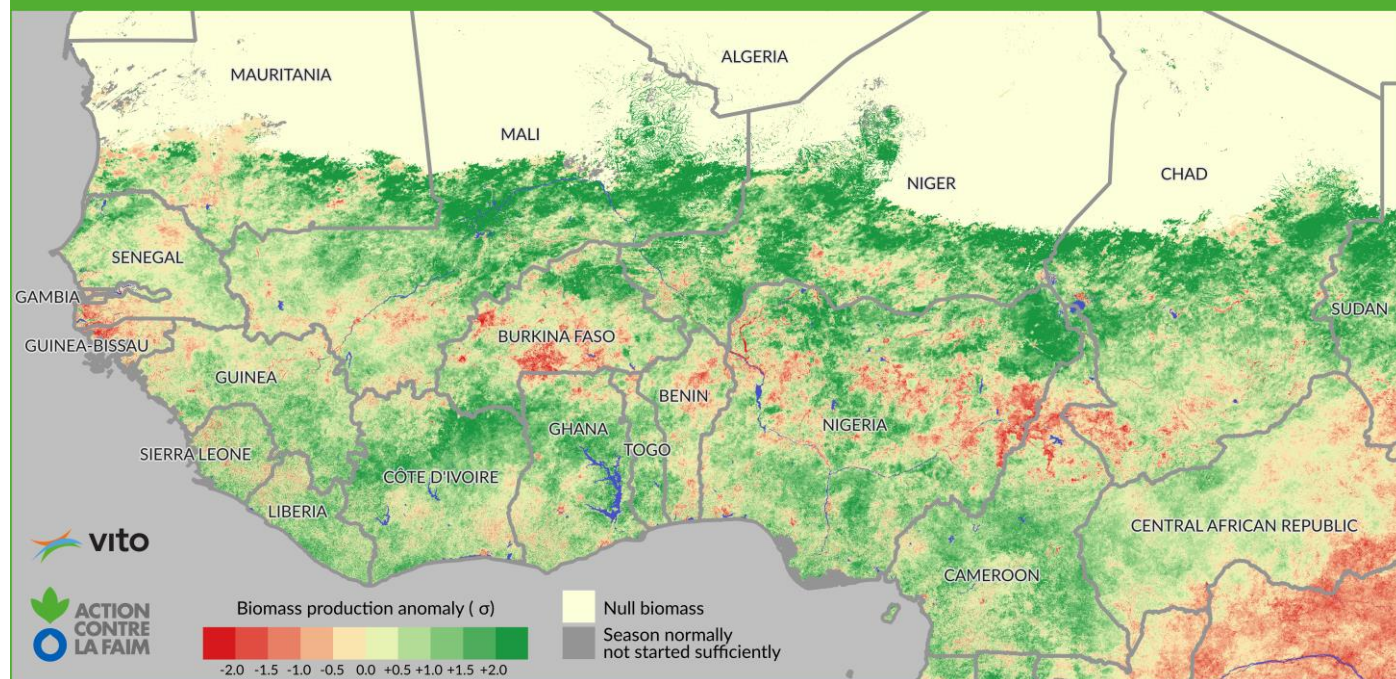
In western Mauritania, in the regions of Tagant, Brakna and Trarza, production is below normal, but within a range of variation that remains usual due to the high variability in this area.

In Senegal, in the Matam region of agropastoral use, production is low and within an unusual limit. In the south of The Gambia, the predominantly agricultural regions of Ziguinchor, Sedhiou and Kolda show negative anomalies in biomass production.

In Burkina-Faso, the predominantly agricultural regions of Centre-West and Boucle du Mouhoun show a production deficit exceeding the normal variability in this area.

These anomalies in biomass production in 2020 compared to previous years are illustrated in more detail by analyses of seasonal and interannual biomass variability.

**MAP 3: NORMALISED BIOMASS PRODUCTION ANOMALY YEAR 2020**



## INTER-ANNUAL VARIATION IN BIOMASS PRODUCTION

Based on the division by livelihood zones, it is possible to observe the interannual variation in biomass production according to land use: Agricultural and Agropastoral.



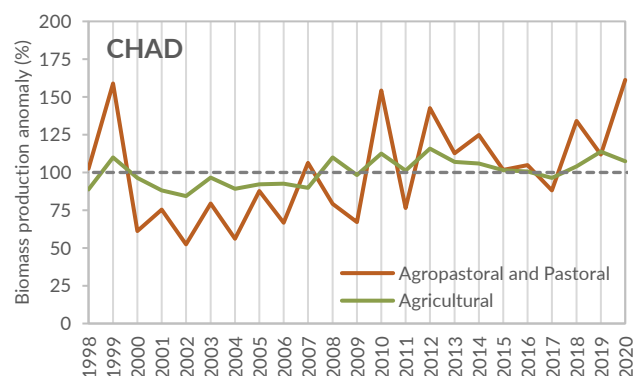
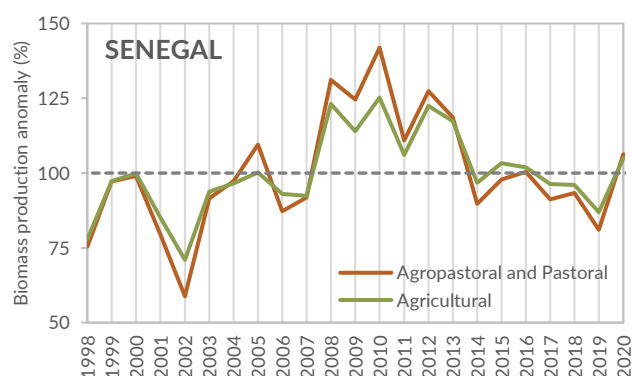
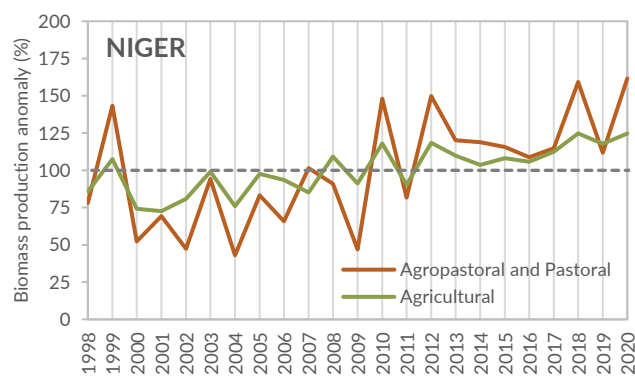
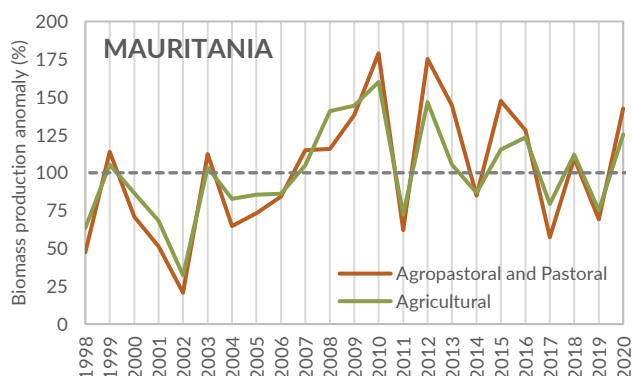
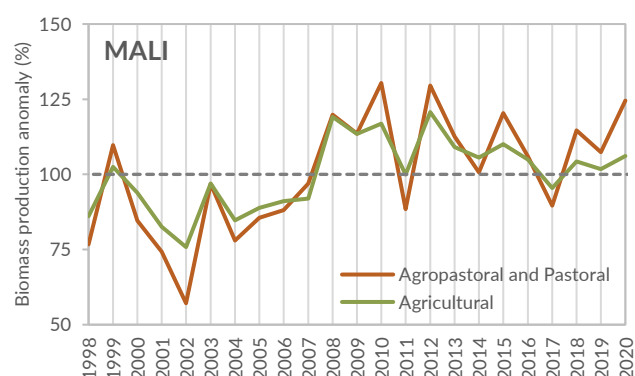
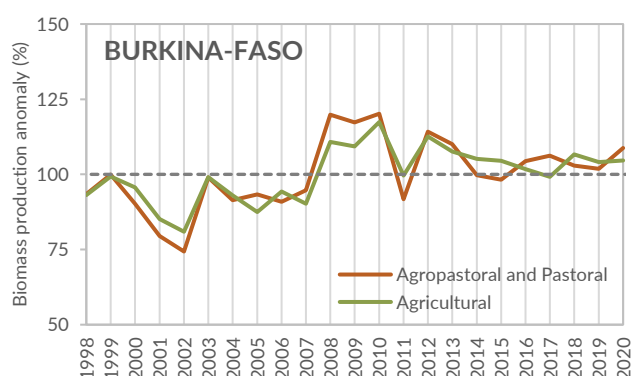
For the elaboration of these comparisons the initial classes Agropastoral and Pastoral are brought together in order to obtain statistics on the entire area of pastoral use.

These graphs show a year 2020 in clear progress compared to the year 2019 and everywhere above the average 1998-2020.

For 2020, production records can be observed in the agropastoral areas of Niger and Chad.

From an overall point of view, Biomass production in agricultural areas is also higher than normal or close to normal, reflecting a good wintering season.

In Senegal and Mauritania, the progress is mixed, with values slightly higher than normal but with a significant rebound compared to 2019.

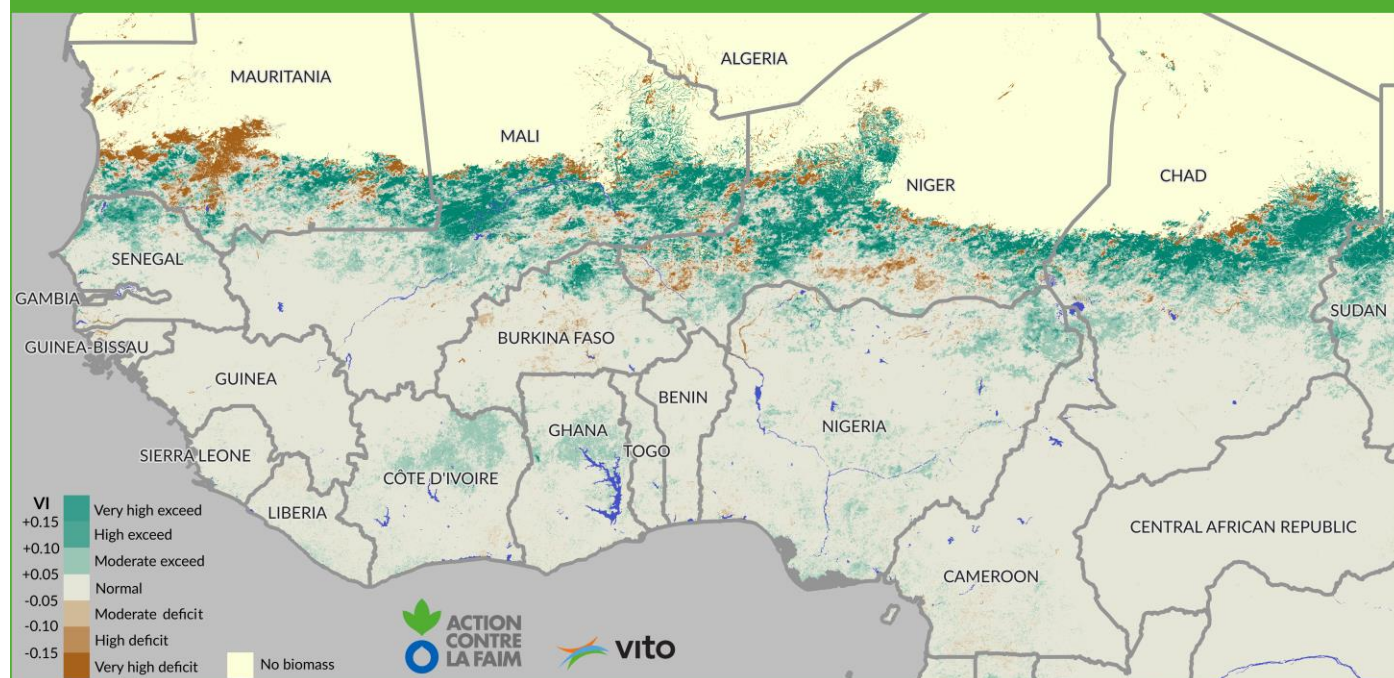


## COMPARISON OF 2020 WITH RECENT YEARS

Biomass-related vulnerability index VI, represented by map 5, is sensitive to the variations in production recorded in recent years and highlights areas with successive biomass deficits.

While the majority of the Sahelian zone shows a positive vulnerability index, the western part of Mauritania shows a negative index due to the succession of dry years especially in 2017 and 2019.

**MAP 5: BIOMASS VULNERABILITY INDEX 2020**



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

This table shows an overall positive situation for the year 2020, a clear improvement compared to 2019.

Although the year 2020 is on average positive, the agropastoral areas of Mauritania show a negative vulnerability index due to the severe droughts of 2017 and 2019.

Senegal benefits from a better year in 2020 but still suffers from the impact of dry years since 2017, particularly 2019.

|              |                           | Anomaly 2016 | Anomaly 2017 | Anomaly 2018 | Anomaly 2019 | Anomaly 2020 | VI 2020 |
|--------------|---------------------------|--------------|--------------|--------------|--------------|--------------|---------|
| Burkina-Faso | Agropastoral and Pastoral | +0.4σ (104%) | +0.5σ (106%) | +0.2σ (103%) | +0.2σ (102%) | +0.7σ (109%) | 0.02    |
|              | Agricultural              | +0.2σ (102%) | -0.1σ (099%) | +0.7σ (107%) | +0.4σ (104%) | +0.5σ (105%) | 0.00    |
| Mali         | Agropastoral and Pastoral | +0.3σ (106%) | -0.5σ (090%) | +0.8σ (115%) | +0.4σ (107%) | +1.3σ (125%) | 0.08    |
|              | Agricultural              | +0.4σ (105%) | -0.4σ (095%) | +0.4σ (104%) | +0.1σ (102%) | +0.5σ (106%) | 0.01    |
| Mauritania   | Agropastoral and Pastoral | +0.7σ (128%) | -1.0σ (057%) | +0.2σ (110%) | -0.7σ (069%) | +1.0σ (142%) | -0.07   |
|              | Agricultural              | +0.8σ (123%) | -0.7σ (079%) | +0.4σ (112%) | -0.8σ (075%) | +0.8σ (125%) | 0.04    |
| Niger        | Agropastoral and Pastoral | +0.2σ (109%) | +0.4σ (115%) | +1.6σ (159%) | +0.3σ (112%) | +1.7σ (162%) | 0.05    |
|              | Agricultural              | +0.4σ (106%) | +0.8σ (112%) | +1.5σ (125%) | +1.1σ (118%) | +1.5σ (125%) | 0.04    |
| Senegal      | Agropastoral and Pastoral | +0.0σ (100%) | -0.5σ (091%) | -0.3σ (093%) | -1.0σ (081%) | +0.3σ (106%) | 0.04    |
|              | Agricultural              | +0.1σ (102%) | -0.3σ (096%) | -0.3σ (096%) | -0.9σ (087%) | +0.4σ (105%) | 0.02    |
| Chad         | Agropastoral and Pastoral | +0.1σ (105%) | -0.4σ (088%) | +1.0σ (134%) | +0.4σ (112%) | +1.8σ (161%) | 0.08    |
|              | Agricultural              | +0.1σ (101%) | -0.4σ (096%) | +0.4σ (104%) | +1.5σ (114%) | +0.8σ (107%) | 0.02    |



## RAINFALL CONTEXT

Although water is the parameter limiting the growth of vegetation in the Sahelian zone, it is also the distribution of rainfall that affects growth.

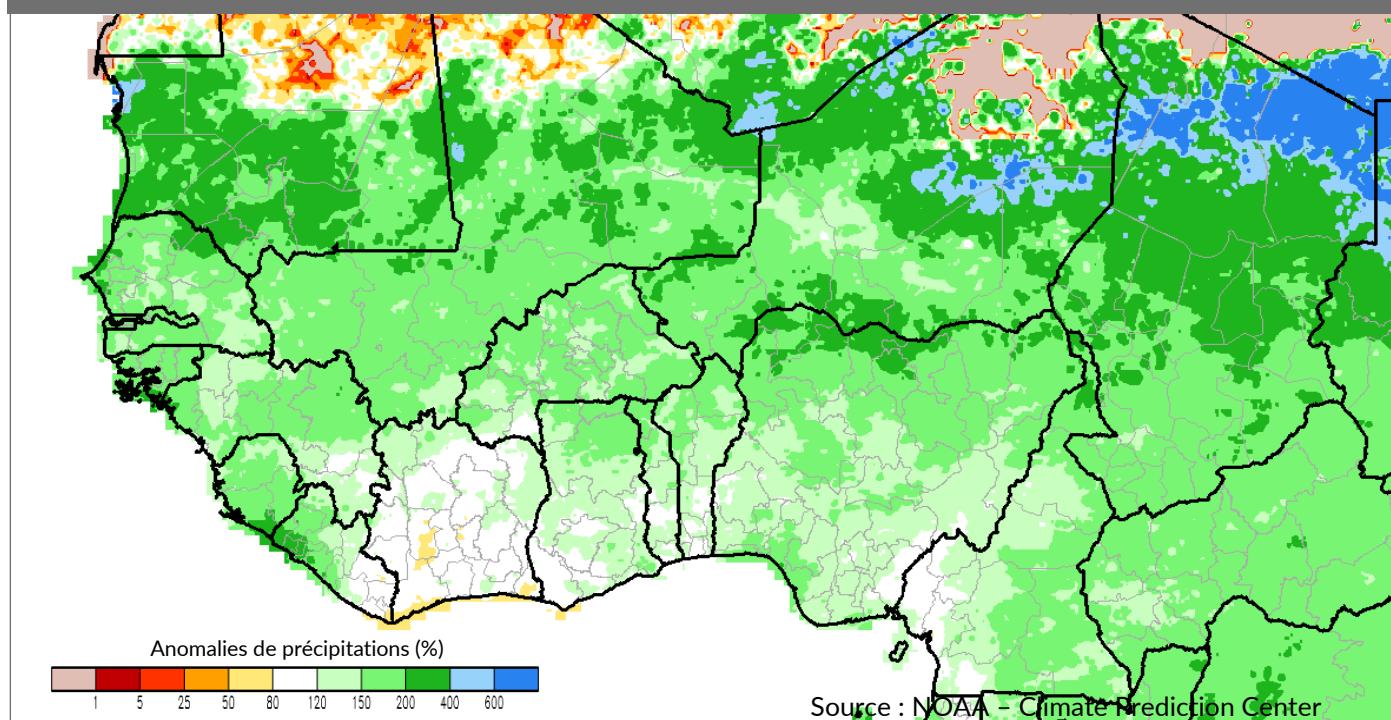
Maps 6 and 7 show cumulative rainfall derived from satellite imagery over the 2020 rainy season. The maps come from two distinct sources: NOAA-Climate Prediction Center and USGS.

The year 2020 is positive over the entire Sahel in terms of rainfall with above normal values.

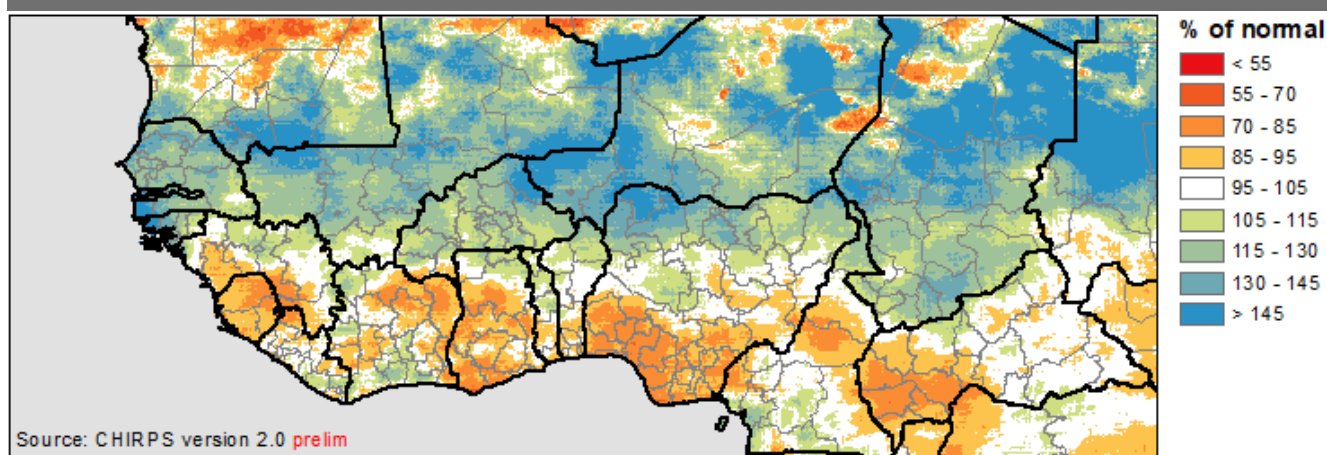
Only the northern part of Mali and Mauritania show moderate rainfall deficits in correlation with the deficit in biomass production recorded in this zone.

The positive rainfall anomalies recorded mostly in the Sahel corroborate the excess biomass production measured over most of the territory.

**MAP 6: RAINFALL ANOMALIES MAY-SEPTEMBER 2020 (NOAA-CPC)**



**MAP 7: RAINFALL ANOMALIES MAY-SEPTEMBER 2020 (USGS)**



Map produced by USGS/EROS



## CONCLUSION

### WINTERING SEASON 2020

The 2020 wintering season has been much more productive than the 2019 season, which was marked by significant biomass deficits in most of the countries of the Sahelian strip. The presence of large surpluses of biomass is promising for the herders and heralds a shorter pastoral lean season than in the past year. Nevertheless, deficits can be observed in certain regions of Mauritania and in the Matam region of Senegal. These deficits come after several years (6 to 4 years depending on the area) of consecutive deficits and this has strong negative consequences on the livelihoods of the herders concerned. In these zones, an earlier lean season is expected for 2021.

Despite this good 2020 season, the western part of the Sahel region is still suffering from the accumulation of deficits recorded in recent years. Similarly, the Central Sahel is still confronted to serious security incidents and the situation has a strong negative impact on the mobility of herders, their access to pastures and thus the renewal of their livelihood. Finally, pastoralists are still confronted with the consequences of the sanitary measures imposed during the 2020 pastoral lean season.

### OUTLOOK FOR 2021

The outlook for 2021 is therefore contrasted. While the positive impact of apparent fodder availability is undeniable, the region's pastoral and agropastoral production systems have been permanently weakened by an abnormally long pastoral gap and the cumulative effects of anthropogenic and epidemiological shocks.

It is therefore important to maintain and strengthen a relevant pastoral monitoring system. It is also key to anticipate once again the need for urgent action to preserve the livelihoods of pastoralist communities, particularly in specific regions of Mauritania and Senegal and in the Central Sahel.

The pastoral areas of Senegal and Mauritania are still recovering from the successive droughts that have occurred during the last 6 years in these regions. These areas have also been heavily impacted by mobility restrictions in connection with health measures to slow the spread of SARS-CoV-2. Thus, if the expected impacts of the positive biomass anomalies are very good news for these regions, it is nevertheless true that the time needed for the recovery of herds and production systems will be long. Livestock farmers in these regions must be supported to facilitate the recovery of the populations concerned.

In other regions, regular monitoring of the herd situation remains key to anticipate possible difficulties related to mobility restrictions and access difficulties.

Finally, most of the countries in the sub-region have been severely impacted by floods that have destroyed human and animal lives, socio-economic infrastructure and thousands of hectares of food crops, and encouraged the arrival of water-borne diseases. This requires accompanying measures for recovery actions in favour of the affected communities.

Pastoralism is often given low priority on national and regional emergency response and development agendas. The good biomass production year offers an opportunity to work more on the sectoral structural issues in order to support this sector on which 30% of the Sahelian population and a significant portion of the GDP of the countries concerned directly depends.

In close partnership with herders and pastoralists organisations, there is also an opportunity to develop and implement technical innovation related to pastoralists resources management such as locally adapted fodder production and holistic Management.



## **RECOMMENDATIONS**

- Consult ACF's Biomass Early Warning Guide available on [SigSahel.info](http://SigSahel.info)
- Carry out regular monitoring during the off-season on vulnerable target areas in Mauritania, Senegal and Burkina Faso.
- Integrate support to the pastoral sector at the heart of intervention strategies in the sub-region.
- Involve the different actors in the development and sustainability of the pastoral sector:
  - Repositioning of the pastoral sector
  - Strengthening of public livestock services and pastoral organisations
  - Improvement of pastoral infrastructures
  - Veterinary support and livestock vaccination

The data used comes from the data generated by the COPERNICUS terrestrial service, the European Commission's Earth observation programme. The research that led to the current version of the product has received funding from various research and technical development programmes of the European Commission. The product is based on data from PROBA-V (©) and SPOT-VEGETATION (©) ESA

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