Meteorological Data and Climatology Lead Executive

Climatology and Remote Sensing Desk

Ten Daily Satellite Rainfall Estimation and Vegetation Coverage Bulletin

1st Dekad of October 2024

Date: Oct 16, 2024

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As an entity responsible for monitoring local and country-wide climatic features and their day-to-day evolution, the National Meteorological Agency of Ethiopia strives hard to present useful information to different socio-economic activities. The production of satellite-based rainfall estimates and vegetation greenness bulletin is part of this effort.

The launch of meteorological satellites which happens as a result of technological advancement opens a new horizon in weather and climate monitoring. Unlike manned point observations, satellites collect data on clouds, vegetation, and other parameters from parts of the world that are not easily reachable or accessible. Satellite observation supplements ground manned observation and when it comes to vegetation cover, it is the only source of information.

The Ethiopian Meteorological Institute uses products from the TAMSATA group based in UK and Copernicus for producing dekadal rainfall estimates and vegetation greenness bulletins. We have a strong belief that various socio-economic activities related to planning disaster mitigation, water resources management, construction, environmental protection, transportation, recreation, tourism, and others will benefit most from the careful and continuous use of this bulletin. Meanwhile, your comments and constructive suggestions are highly appreciated to make the objectives of this bulletin a success.

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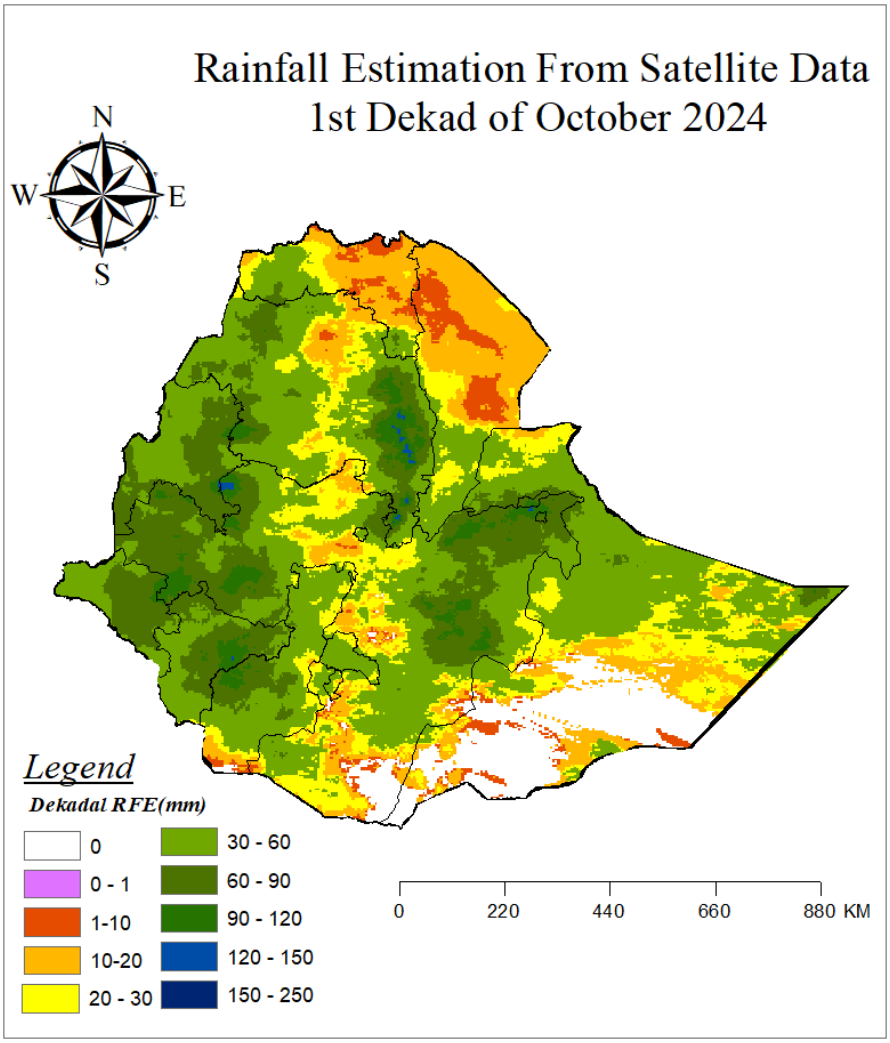
Introduction

Satellite remote sensing is often used to estimate vegetation distribution and productivity at large spatial scales. The normalized difference vegetation index (NDVI) is the most widely used surrogate for large-scale assessments of vegetation greenness and has been applied in a wide range of studies (Brandt et al. 2015, Chen et al. 1998; Santos and Negri, 1997; Zhang et al 2009). The spatial distribution of remotely sensed NDVI and consequently of terrestrial vegetation is a function of prevalent climatic conditions such as rainfall and temperature. The relationship between NDVI and rainfall is well established at various spatial and temporal scales (Davenport et al. 1993; Grist et al. 1997; Nicholson et al. 1990; Potter and Brooks 1999; Wang et al. 2001). The results of these studies, although varying, indicate that rainfall is an important predictor of the geographical distribution of vegetation in many environments, particularly in transitional zones, such as from humid to arid and semi-arid environments (Zhao et al. 2015) as found in the Sahel of Africa.

Rainfall is a crucial resource in many socioeconomic activities, particularly for those African countries relying predominantly on rain-fed agriculture. Many countries have been affected by rainfall variability and long-term changes in both rainfall amount and distribution over recent decades. However, the number of rain gauges throughout Africa is small and unevenly distributed, and the gauge network is deteriorating. Satellite rainfall estimates are being used widely in place of gauge observations or to supplement gauge observations. (Tufa Dinku et al).

In this bulletin, the 1st Dekad of October 2024 satellite rainfall estimation and vegetation greenness were produced with the help of TAMESAT and METOSAT vegetation products. During this dekad, some parts of Bega rain-benefiting areas received moderate rainfall as a result of the strong relationship between rainfall and the Normalized vegetation index (NDVI) most Bega-benefiting areas (southern, southwest and southeast) as well as other parts of the country were covered by Vegetation. On the other hand, the southern, southern western, eastern, and southeast parts of the country received minimum to no rainfall, and low to bare greens were observed in the country.

Rainfall Estimation from Satellite Data

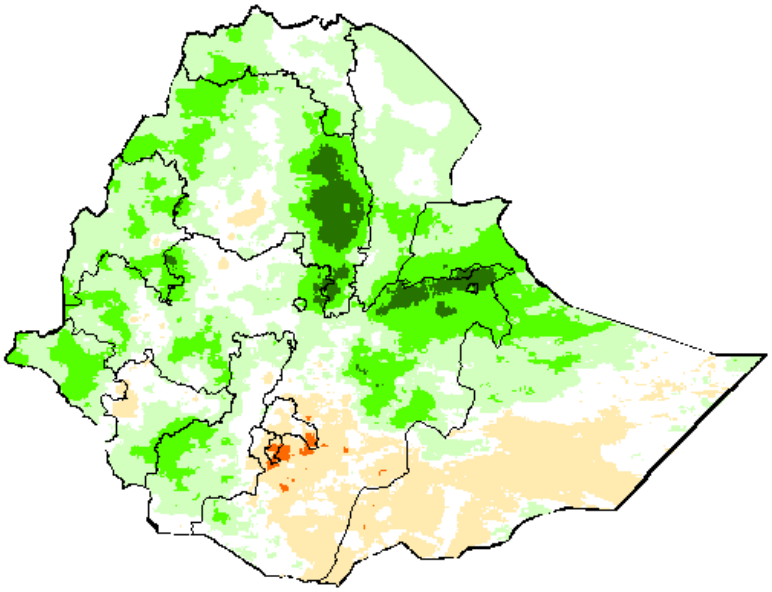


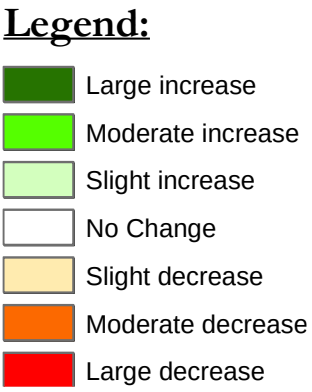
Rainfall distribution

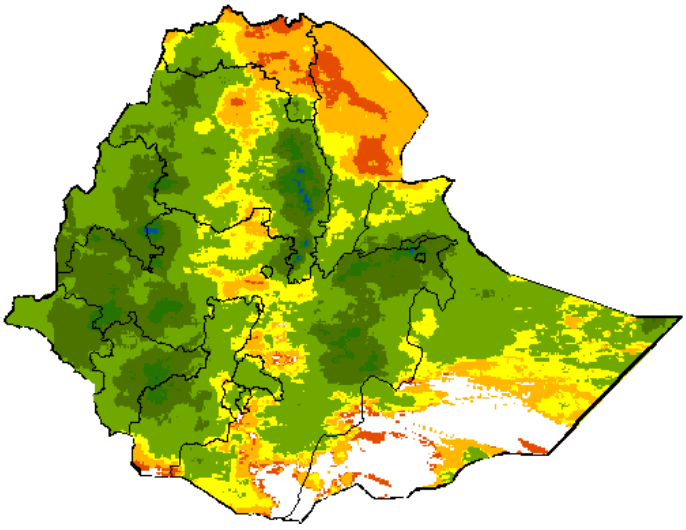
The Bega season, spanning from October to January, marks the dry season for most of the country. By the first dekad of October, rainfall has commenced in various parts of the country. Specifically, Rainfall has been observed in Benishangul Gumuz, Gambella, Sidama, South West Ethiopia, South Ethiopia, Central Ethiopia, Dire Dawa, Harari, most of Oromia, some parts of Amhara, Somali and Tigray regions received between 30 – 120mm. Conversely, minimum and no rainfall has been recorded in the other parts of the country.

Comparison with climatological normal

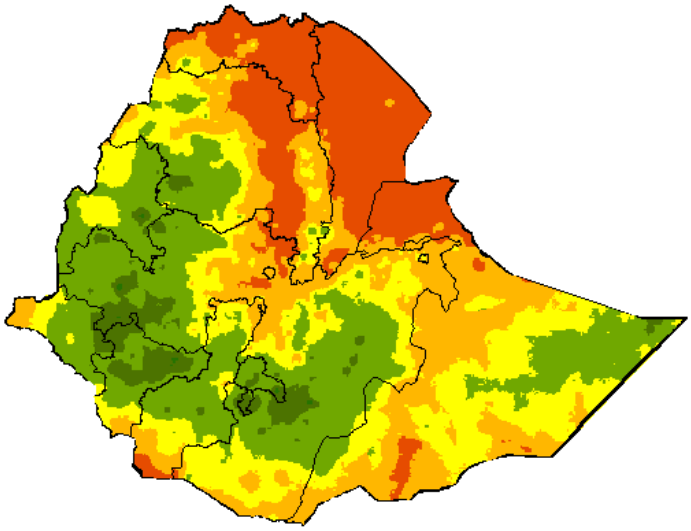
In this dekad the comparison of satellite rainfall estimation and climatological average shows that was slight to moderate increase of rainfall was observed in Gambella, Benishangul Gumuz, South Ethiopia, Tigray, Central and western Oromia, Somali, and Afar, and also slight to a large increase in Dire Dawa, Harari, and Amhara regions. On the other hand, a slight to moderate decrease in rainfall was observed in southern Oromia and Somali regions. No change in the rest part of the country.







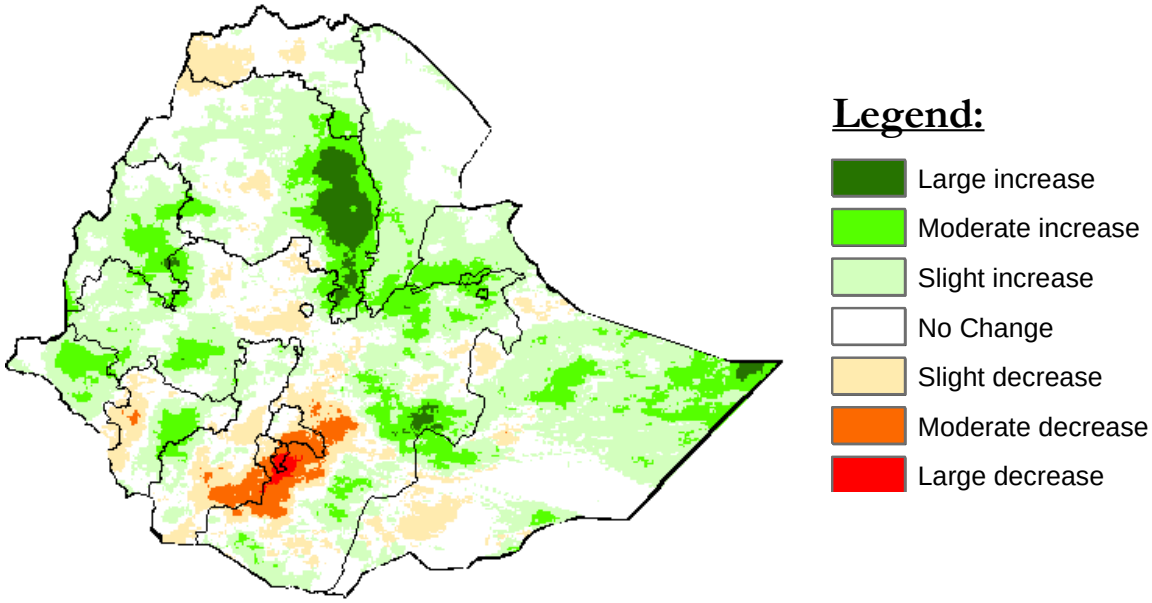
Current dekad



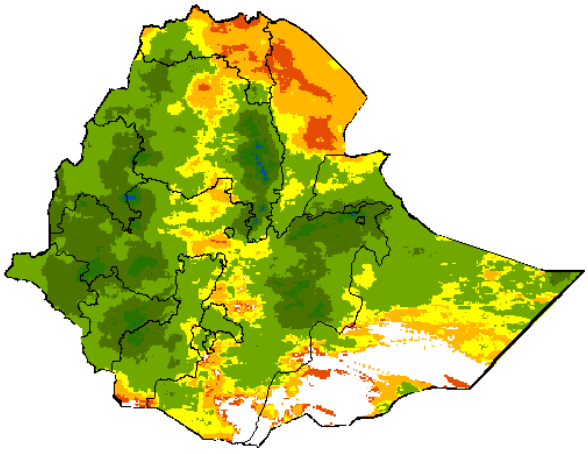
Climatological normal

Comparison with the previous Dekad

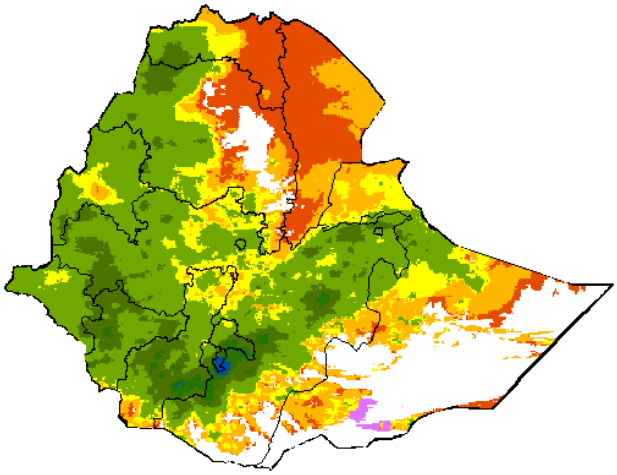
The comparison of the 1st dekad of October 2024 and the 3rd dekad of September 2024 shows that a slight to a large increase of rainfall was observed in Amhara, Somali, Gambella, Benishangul Gumuz, and western and eastern Oromia regions. On the other hand, a slight to moderate decrease in rainfall was observed in Sidama, South Ethiopia, and southern Oromia regions. No change in the rest part of the country.



Difference of two Dekad



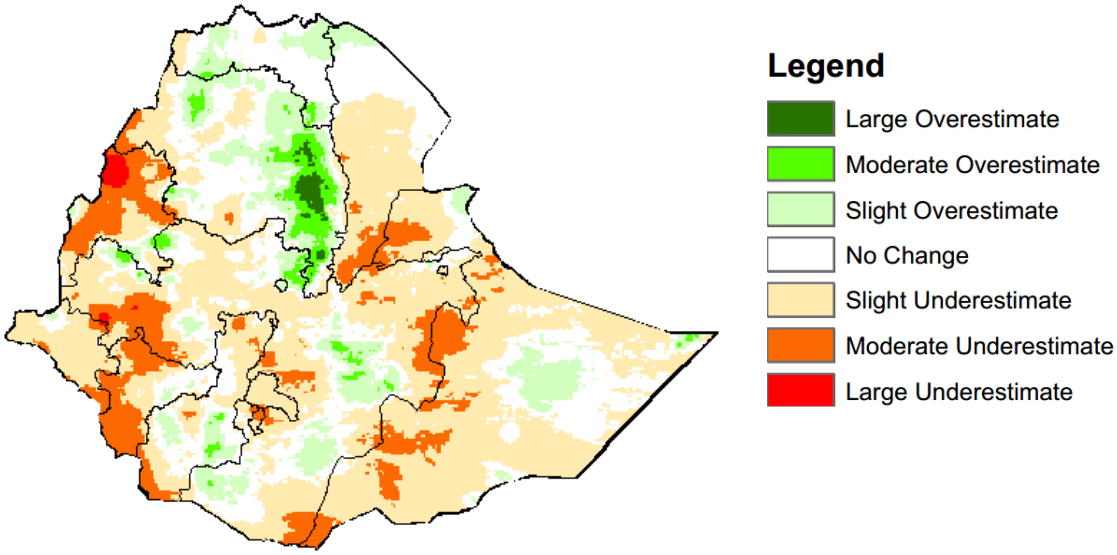
Current dekad

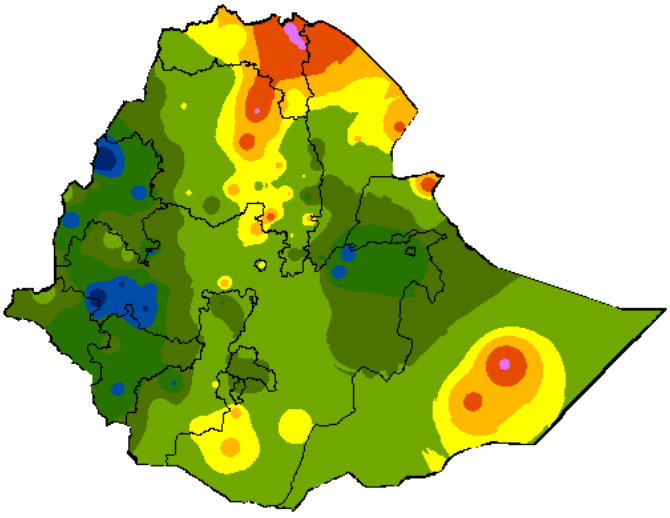


Previous dekad

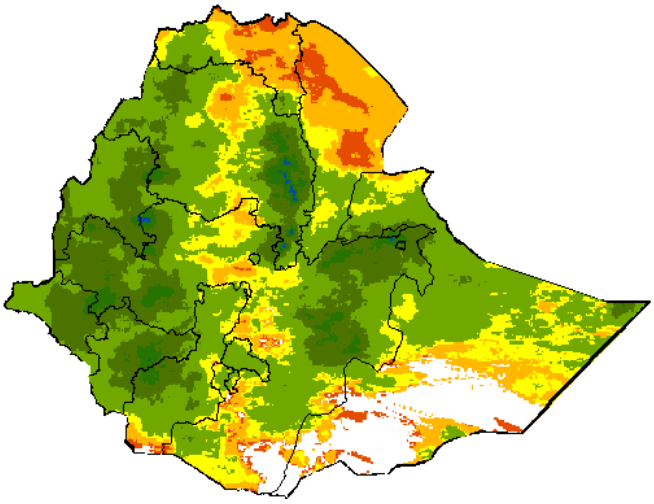
Comparison with the ground observation

The satellite rainfall estimation shows that there was a slight to large overestimate observed in some pocket areas of the Amhara, Oromia, and Tigray regions. On the other hand, a slight to moderate underestimate was observed in Benishangul Gumuz, Gambella, South West Ethiopia, South Ethiopia, Oromia, Central Ethiopia, Sidama, Afar, and Somali regions. There is no significant difference in the rest parts of the country, it shows the same pattern as compared with the Actual.



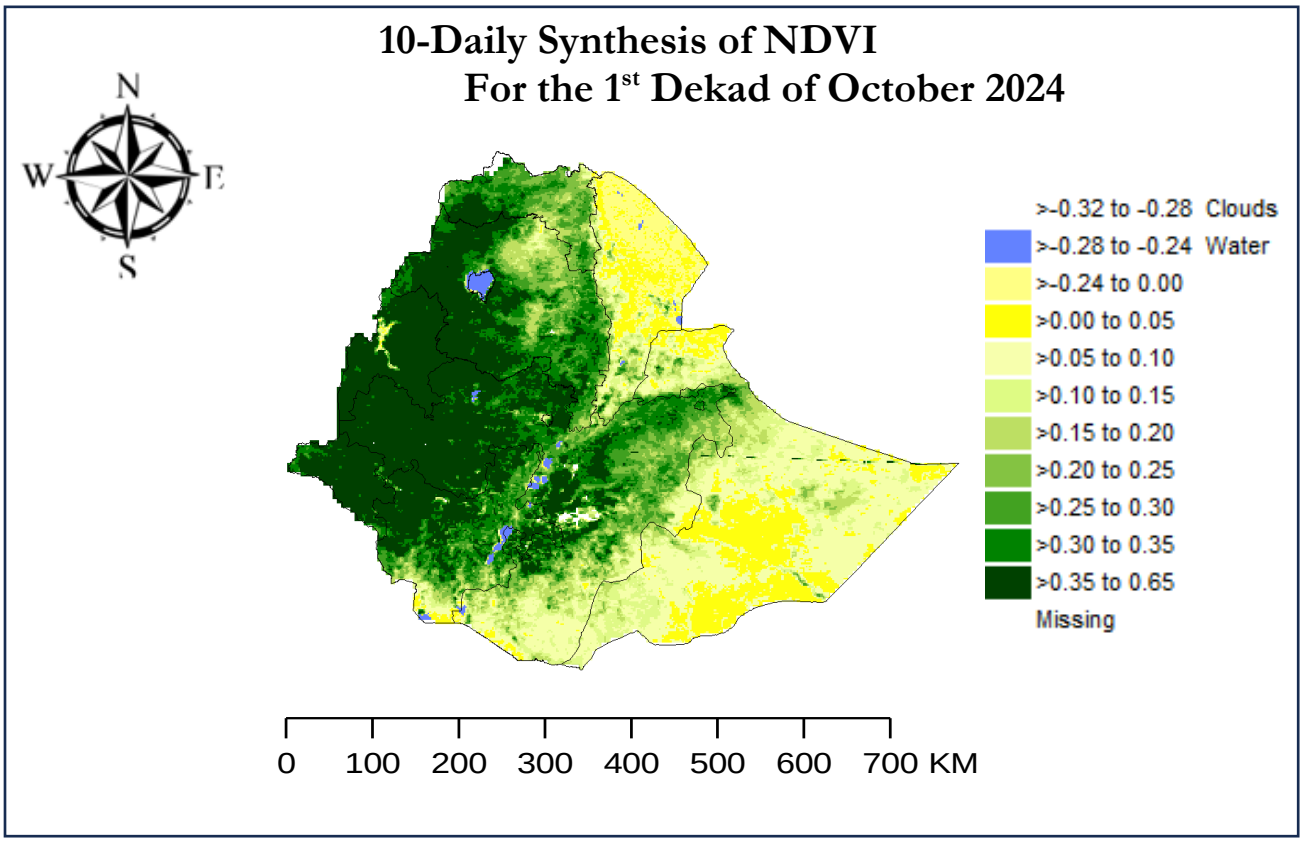


Ground Observation



Satellite rainfall estimation

10-Daily Synthesis of NDVI



Assessment of synthesis NDVI for the 1st dekad of October 2024

NDVI distribution for this dekad declared high greenness over most parts of the country. Whereas low NDVI values have been observed over some parts of the country. Hence, South West Ethiopia, South Ethiopia, Benishangul Gumuz, Sidama, Gambella, Central Ethiopia, Tigray, Amhara and most parts of Oromia regions are covered by high to moderate greenness. Somali, Afar, and southern Oromia regions are covered by low to bare greenness. (Refer to the *actual* figure above).

Comparison with the Climatological Normal

The comparison of current dekad with climatological normal shows that a small to a large increase of greens was observed in Dire Dawa, Harari, Afar, Somali, some pocket areas of Tigray, Amhara South West Ethiopia, South Ethiopia, and Oromia regions. On the other hand, a small to large decrease in greenness was observed in Gambella, Benishangul Gumuz, Amhara, Central Ethiopia, and western and central Oromia regions.