Seasonal Pastoral Climate Advisory Bulletin (October to December 2024) for Ethiopia

September 2024

ACRONYMS

BoM	Bureau of Meteorology
EIAR	Ethiopian Institute of Agricultural Research
ENSO	El Niño Southern Oscillation
HSI	Heat Stress Index
IOD	Indian Ocean Dipole
GCM	Global Climate Models
ITCZ	Intertropical Convergence Zone
IRI	International Research Institute
MME	Multi-Model Ensemble
OND	October, November, and December
THI	Temperature-Humidity Index
PCA	Pastoral Climate Advisory
PCoPs	Pastoral Community of Practice
WRSI	Water Requirement Satisfaction Index

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Disclaimer

The OND seasonal pastoral advisory is developed with the field experiment data, GCM outputs and reanalysis data from satellites. With the possibilities of the uncertainty in GCM and satellite outputs, a cascaded effect during the data assimilation is highly probable. In such cases, **EIAR** will not guarantee for the seasonal pastoral outlook accuracy and neither accepts any liability for any loss or damage resulting from its use. We also strongly advice users to reinforce their decisions with the intra-season updates from Ethiopian Meteorological Institute.

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Preamble

The October to December 2024 seasonal forecast for pastoral regions anticipated rainfall trends across the Ethiopian lowlands. It indicates that below-normal rainfall is likely in the southern, eastern, and southeastern areas. Specifically, the Borana and South Omo zones, as well as various regions in Oromia, are predicted to experience normal to below normal rainfall. In contrast, the Somali and Afar regional states are predicted to face significantly below-normal rainfall, having potential impacts on the target pastoral activities in these regions. To address these challenges, it is essential for local authorities and pastoral communities to adopt proactive measures, such as implementing all possible water management, including indigenous practices and promoting sustainable soil and water conservation practices to mitigate its adverse effects.

Additionally, the predicted pasture coverage during the OND season will be poor in the Afar region, South Omo zone, Borana zone, and most areas of the Somali region, except for the eastern Somali zones where moderate pasture availability is expected. This disparity in pasture conditions is crucial for the health of livestock and the livelihoods of communities in the affected regions. Therefore, it is essential for the pastoral communities and local authorities to promote and implement practices that can enhance pasture management and optimize the utilization of available resources.

Regarding heat stress, the Borana Zone will likely experience less heat stress than the Afar and Somali regions during the OND season. Heat stress level in the Afar region is expected to be moderate to severe in October, while the Somali region may also face moderate heat stress. To address this, communities in these regions should implement heat management practices like providing shade and ensuring sufficient watering for their livestock.

Moreover, heat stress is expected to persist in irrigated lowland wheat farms, particularly affecting critical growth stages; like flowering, seed setting, and grain filling, which may lead to crop failure. To effectively manage heat stress in wheat farming, it is recommended to plant strategically: in Gode, Kelafo, and Dega Habur, planting from early to mid-October is advised; while for Amibara, planting in the fourth week of September is advised, For Selamago, planting from early October is advised. Additionally, utilizing heat-tolerant varieties and implementing effective irrigation practices will further help mitigate heat stress.

Finally, given the anticipated drier rainy season across most pastoral regions, pastoral communities may face an increased risk of resource-related conflicts and unintended migrations. To address these potential tensions, it is crucial to engage in proactive community dialogue through different community platforms, including the Pastoral Community of Practice Alliance (PCoPs-Alliance), targeting scarce resource management, raise community awareness, and establish early warning systems.

Background

Bega (October-December) season is characterized by dry conditions over Ethiopia, except for a few southern and southeastern zones which get about 400 mm rainfall following the southward retreat of Intertropical Convergence Zone (ITCZ). The livelihood of pastoralists and agro-pastoralists inhabiting the southern and southeastern Ethiopia depends on this second rainy season. Climatologically, the Bega season's rainfall is primarily influenced by large-scale climate phenomena such as El Niño Southern Oscillations (ENSO), and the Indian Ocean Dipole (IOD). For the upcoming Bega season, IRI ENSO forecasts show a weak and short-lived La Niña conditions and Indian Ocean Dipole is likely to remain neutral, but slightly negative, for the rest of the year (Bureau of Meteorology/BoM). La Niña events often lead to drier-than-usual conditions during the OND rainy season.

The seasonal rainfall is the driving factor in maintaining the livelihood activities in pastoral regions, as it directly influences both forage and water availability. Consequently, dry conditions exacerbate heat stress, a major concern in hot climates, leading to reduced feed intake, poor body condition, lower milk production, and impaired reproductive performance. In Ethiopia's pastoral zones, where livestock are a primary livelihood source, heat stress risk is rising with fluctuating temperatures. This pastoral-climate advisory (PCA) focuses on the lowland and pastoral areas of the country to adapt improved grazing practices, consideration of water harvesting solutions and mitigate the heat stress risk to animal health.

Dynamic seasonal and sub-seasonal rainfall prediction

For the October, November, December (OND) 2024, multi-modal approach depicts below normal rainfall is favored in southern, eastern, and southern eastern parts of the Ethiopian lowlands. Borana (Oromia) and South Omo zone of Southern Ethiopia will experience normal to below normal rainfall pattern. Whereas significantly below normal rainfall is expected in Somali and Afar regional states.

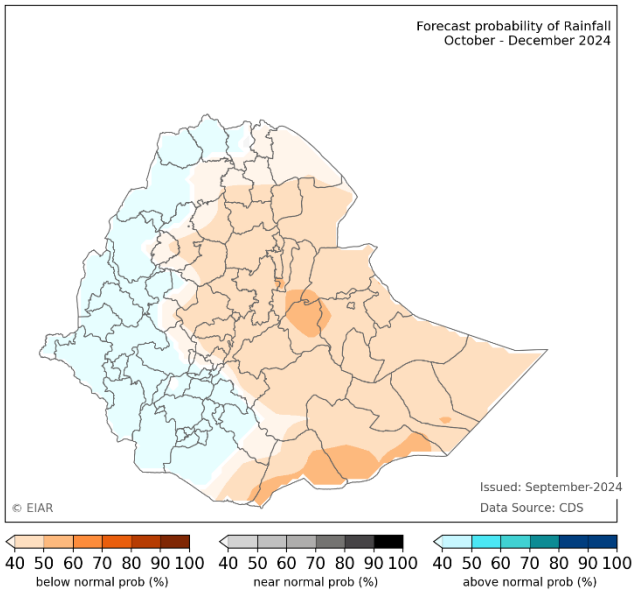


Figure 1. Multi-Modal ensemble dynamical seasonal forecast for OND 2024

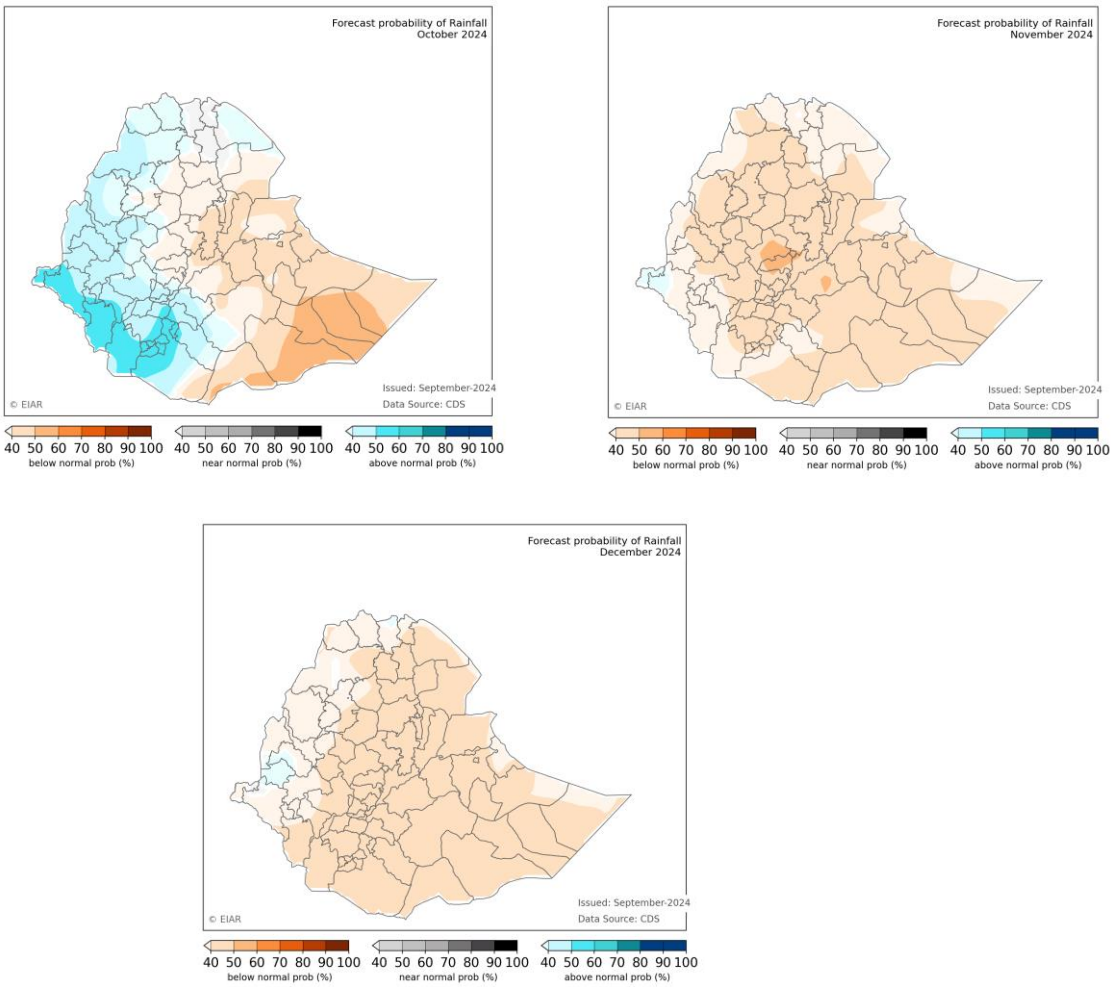


Figure 2. Multi-Modal dynamical monthly rainfall forecast for October, November, and December

- In October (top leftmost, Figure 2), closer to normal rainfall are favored in South Omo and Guji Zones and western parts of the Borana zone, while the rest of lowlands of the country are expected to be drier than normal condition.
- In November, (top rightmost, Figure 2), the dry conditions are expected to prevail in eastern, Southern and Southeastern parts of the lowlands, which is influenced by the enhancement of La Nina.
- In December, (bottom, Figure 2), dry conditions are expected to persist across all lowlands, eastern, southern and southeastern parts of the lowlands,

Rangeland water status prediction for the OND 2024

In arid and semi-arid ecosystems, the Water Requirement Satisfaction Index (WRSI) is a valuable tool for monitoring and predicting pasture availability. The pasture coverage during the OND 2024 is expected to be poor in Afar region, South Omo zone, Borana zone, and most zones across the Somali region, except for the eastern Somali zones, where pasture availability is expected to be moderate, as illustrated in Figure 3.

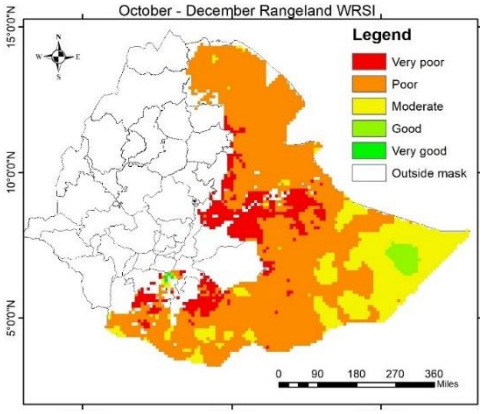


Figure 3. Seasonal rangeland WRSI for OND

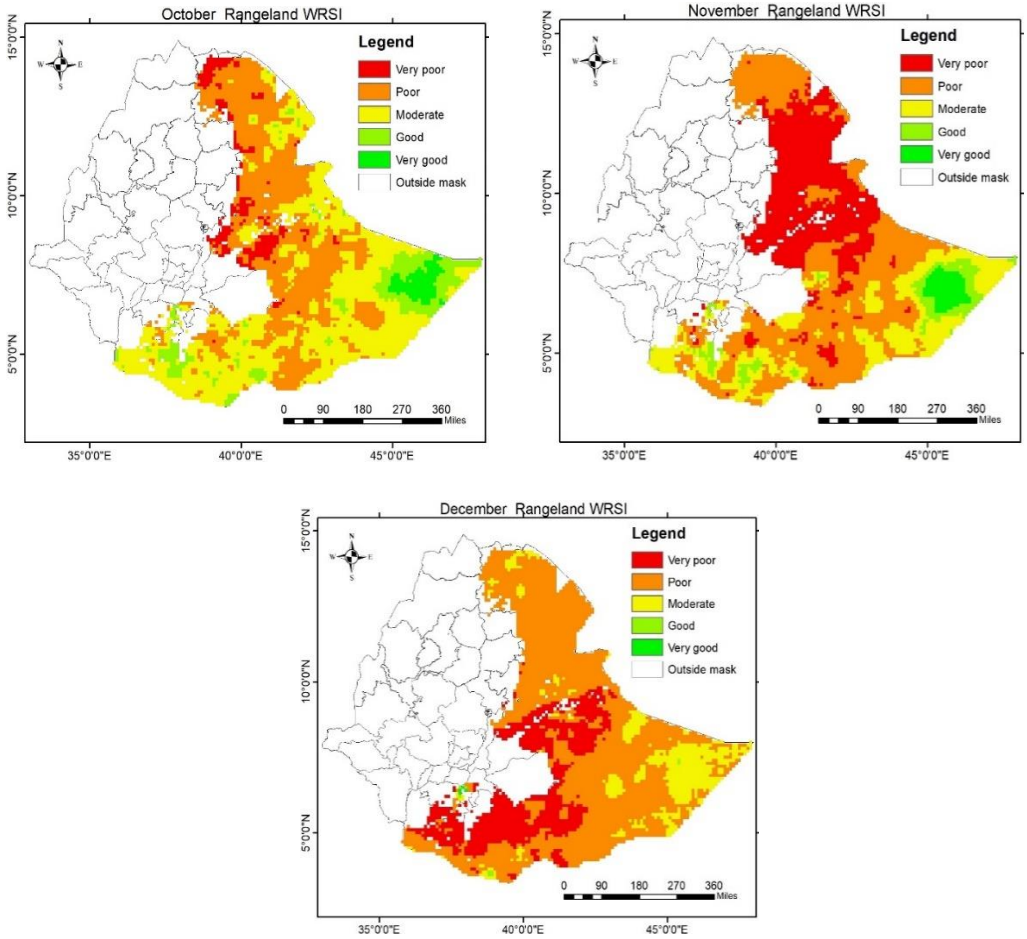


Figure 4. Monthly rangeland WRSI for OND

- In October, moderate to good pasture coverage is expected over South Omo, Borena, Guji, southeastern Somali, southeastern and eastern peripheries of Afar as indicated in the top leftmost of Figure 2.
- In November, as showed in the top rightmost (Figure 4), the pasture coverage is expected to experience a very poor and poor coverage in most parts of Afar region and Somali region respectively, while some parts of the Borana zone and western zones of Somali regional state showing medium pasture coverage.
- In December, (bottom panel, Figure of 4), most of the rangeland areas including Borana, most parts of Somali and Afar regions, and south Omo zones will experience poor to very poor pasture coverage and availability.

Temperature-humidity Index Seasonal Prediction

The Temperature-Humidity Index (THI) is widely used to assess the combined effects of ambient temperature and humidity on livestock health. This section aims to evaluate the likelihood of heat stress during the October–December 2024 season in the pastoral zones of Ethiopia.

In the **Borana Zone**, the THI forecast indicates an integrated reduced likelihood of heat stress during the OND season (Figure 5d). In contrast, the **Afar region** is expected to experience mild to moderate heat stress throughout the season. In October, moderate to severe stress likely occurs in northeastern Afar (Figure 5a), although this will generally decrease as the season progresses toward December. Similarly, the **Somali region** is forecasted to experience mild to moderate heat stress during the OND season. In summary, heat stress will vary by region, with reduced stress expected in Borana, while moderate to severe conditions may affect parts of Afar and the Somali region, particularly in October.

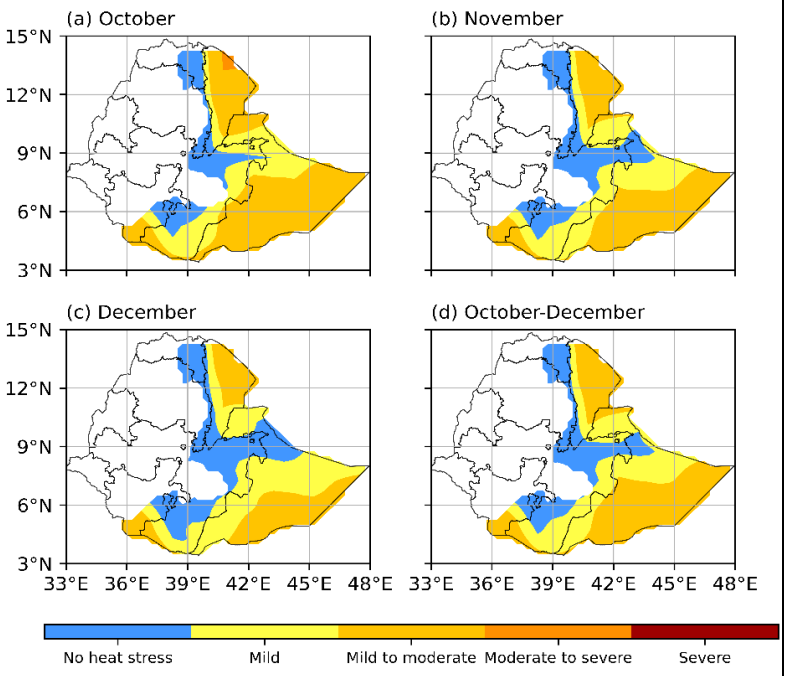


Figure 5. Livestock Heat Stress for October-November-December 2024

Heat Stress Conditions for Irrigated Lowland Wheat Production during OND 2024

During the OND, continued heat stress is expected in irrigated lowland wheat farms. If the heat load coincides with critical crop growth stages, such as flowering, seed setting and grain filling stages of wheat crop; this results in aborted fertilization and crop failure. Using the Heat Stress Index (HSI) and crop simulation models, we advised planting windows as shown in the Figure 6 to reduce the impact of heat stress on the standing wheat crop. In this simulation, a 90-day maturing wheat cultivars are used as a showcase at all sites, considering the crop's physiological maturity and harvesting well before March-April-May rainfall.

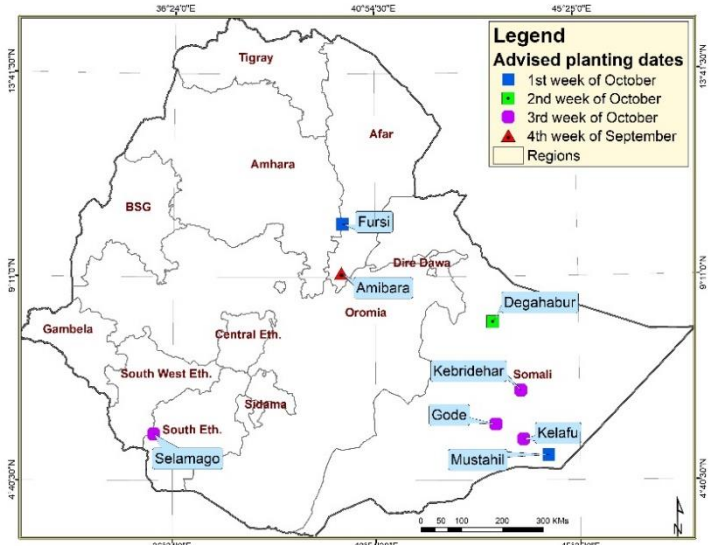


Figure 6. Planting Advisory for irrigated wheat for October-November-December Season

Pastoral Climate Advisory (PCA) for OND 2024

Livestock Water Point Advisory

The seasonal and sub-seasonal rainfall prediction exhibits drier than normal conditions.

- "*Abba_Herega*", an authorized body to manage water, are advised to monitor or watch water resources continuously to avoid shortage of water and provide the necessary water utilization guidance for livestock, based on their respective species, age, as well as for household consumption.
- In the interest of mitigating the impact of dryness on livestock, it is advised to avoid water withdrawal for full irrigation and other purposes.
- For effective water harvesting from the seasonal rain or flash floods, the waterpoint managers are advised to mobilize communities in canal clearance.
- To maintain the quality of the water and avoid wastage in the waterpoints it is highly advised to employ traditional water management methods, such as constructing "*Meri*" (water storage systems).
- For proactive measures stakeholders are encouraged to monitor the status of the waterpoints by visiting https://et.waterpointsmonitoring.net/.

Rangeland Advisory

The expected rainfall for the upcoming Bega season will be unsatisfactory for the growth of rangeland vegetation. Thus, the pastoral communities are advised to:

- Harvest hay from areas with moderate to good pasture performance within the rangelands to conserve existing forage resources.
- Searching for supplemental feed and water from areas other than rangelands with potential feed and water sources to provide supplemental forage.
- Manage and monitor the health of the palatable rangeland vegetation to ensure optimal biomass productivity.
- Moving livestock to areas with adequate feed and water to avoid the adverse impact of the expected dry conditions.
- Commercially destock the number of livestock based on the expected feed unavailability in the rangeland areas.
- Splitting herds into spatially appropriate units and supplementation of pasture resources.
- Keeping the lactating animals and calves around the home garden.

Livestock Heat-Stress Advisory

- In Afar and Somali regions, where mild to moderate heat stress is expected throughout the OND, pastoralists are advised to improve feed quality by increasing the energy content to maintain body weight and cattle milk production.

- In Borana, where reduced heat stress is forecasted, cattle can maintain better feed intake, but it is still advisable to provide high protein forage, such as leguminous plants, to prepare for any unexpected heat or dry conditions.
- In Afar and Somali regions, the provision of shade for cattle either through simple shelters or natural tree cover reduces livestock exposure to heat during the hottest hours.
- It is important to vaccinate cattle before the OND and regularly treat them for parasites. Early detection and treatment of infectious diseases will help reduce health risks.
- In Borana, the risk of diseases like mastitis and foot-and-mouth disease, so routine health check-ups must be attended cautiously for necessary treatment services before causing damage.
- It is advised to avoid overcrowding cattle, particularly on small-scale farms, as this raises body temperatures and increases heat stress.

Planting window related Advisory for Irrigated wheat in lowlands/pastoral areas

- The heat stresses are predicted to be higher at Gode, Kelafo and Dega Habur (Annex 1). Planting from early October until 20th of October is advised for Kebridahar and Kelafo respectively to avoid the stress in late November. For Gode, planting is advised during the early week of October and any further delay in planting will result in coincidence of flowering stage with elevated heat stress.
- For Dega Habur and Mustayil, 11-20th of October planting is advised and further delay in planting will result in coinciding of flowering stage with the elevated heat stress
- For Amibara in Afar, the heat stress is predicted to moderate to less heat stress and planting can start from 4th week of September 2024.
- Selamago in South Omo is expected to show mild heat stress during the first two weeks of November, and it is advised to plant from early October, while caution must be taken about the crop physiological maturity and harvesting well before the advent of the subsequent March-April-May (MAM) rain.
- Use of heat and drought tolerant wheat cultivars that withstand the heat stress conditions.
- Apply efficient irrigation management practices, including drip irrigation or furrow irrigation to reduce water loss through evaporation and ensure crop water use efficiency.

Climate Service for Peace Security

The impact of climate change is increasingly evident, exacerbating conflict on scarce resources (water and pasture at large) among various communities and ethnic groups of pastoral regions, as well as contributing to the ecosystems and landscapes degradation. Although pastoralists inherently share mutual respect stemming from their common socio-cultural backgrounds, tensions can arise over resource utilization, particularly during periods of prolonged and severe droughts.

The weather/climate forecast for the OND 2024 indicates drier than normal season; thus, leading to limited range resources and conflict. Therefore, it is essential to anticipate abnormal migration that could lead to potential conflicts over natural resources. The following are the key advice to the target pastoral communities:

- To effectively mitigate these tensions, it is advised to implement proactive dialogue including the Pastoral Community of Practice (PCoPs) to discuss over the appropriate resource management strategies that promote cooperation among pastoralists by local elders in alignment with their rich socio-cultural traditions.
- Creating awareness about the impacts of climate change is critical to prevent climate risk induced conflicts and to address existing tensions and migration issues.
- Providing timely early warning information to community leaders enables them to disseminate crucial information in advance, fostering cooperation and encouraging strategic resource management. Thus, the government and non-government organizations should be providing training and capacity building for pastoral and agropastoral communities on water points and pasture management, equitable resources distribution, diversification of livelihoods, conflict resolution, and other climate change adaptation responses.
- Public agencies and other development support organizations should incorporate climate security into their peacebuilding and cross-border market development efforts. This integration is essential to prevent potential conflicts and to avoid new conflicts triggered by climate-induced drought.

Reference

Alessandri, A., De Felice, M., Catalano, F., Lee, J. Y., Wang, B., Lee, D. Y., et al. (2018). Grand European and Asian-Pacific multi-model seasonal forecasts: maximization of skill and of potential economical value to end-users. Climate Dynamics, 50(7-8), 2719-2738.

Dado-Senn B, Vega Acosta L, Torres Rivera M, Field SL, Marrero MG, Davidson BD, Tao S, Fabris TF, Ortiz-Colón G, Dahl GE, Laporta J. Pre- and postnatal heat stress abatement affects dairy calf thermoregulation and performance. J Dairy Sci. 2020 May;103(5):4822-4837. doi: 10.3168/jds.2019-17926. Epub 2020 Feb 26. PMID: 32113780.

Eldridge DJ, Delgado-Baquerizo M (2016). Continental-scale impacts of livestock grazing on ecosystem supporting and regulating services

Fauchereau N., Ramsay D., Lorrey A.M., Noll B.E (in preparation): Open data and open-source software for the development of a multi-model ensemble monthly and seasonal forecast system for the Pacific region.

Hoogenboom, G., Jones, J.W., Wilkens, P.W., Porter, C.H., Boote, K.J., Hunt, L.A., Singh, U., White, J.W., Uryasev, O., Ogoshi, R., Koo, J., Shelia, V., Tsuji, G.Y. 2019. A Brief Description of the Decision Support System for Agrotechnology Transfer (DSSAT) Cropping System Model. Advances in Agricultural Systems Modeling. DOI: 10.2134/advagricsystmodel8

Mader, T. L., et al. (2006). "Management of feedlot cattle during high ambient temperature." Journal of Animal Science, 84(3), 665-677.

Peter H, Sandro C (2012). LEAP (Livelihood, Early Assessment, and Protection) version 2.61 software user manual designed for the calculation of a water requirement satisfaction index. World Food Program, FAO, Italy Plant Production and Protection. Paper no. 17 (Rome: FAO).

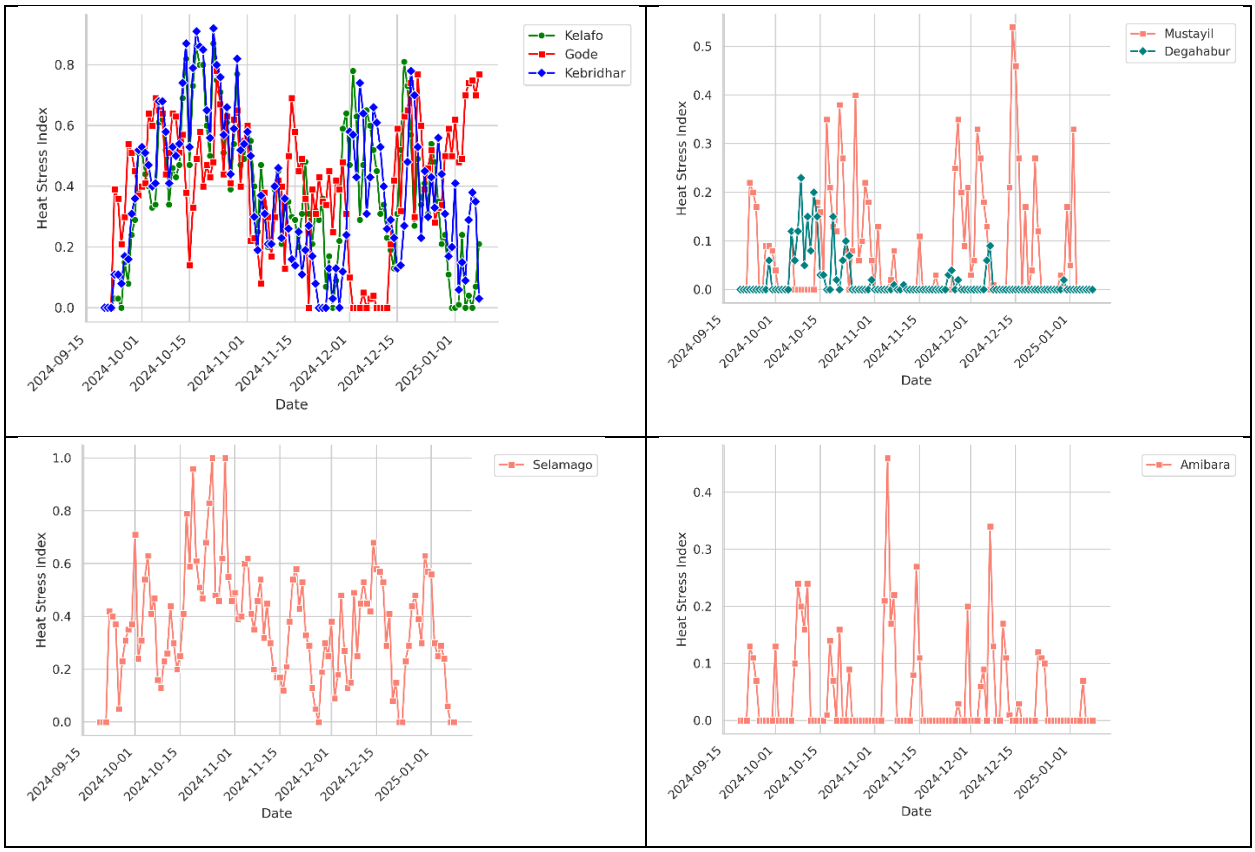
Schlenker, W., Roberts, M.J. 2009. A Crop Heat Stress Index to Better Model Grain Production Impacts of Climate Change. Proceedings of the National Academy of Sciences (PNAS). DOI: 10.1073/pnas.0906865106

Senay GB, Verdin JP, Rowland J (2011) Developing an operational rangeland water requirement satisfaction index. Int J Remote Sens 32:6047–6053. https://doi.org/10.1080/01431161.2010.516028

Prasad, P.V.V., Staggenborg, S.A., Ristic, Z. 2008. Title: Understanding the Impact of Heat Stress on Crop Yield: The Role of Crop Heat Stress Indices in Predicting Yield Reductions. Field Crops Research. DOI: 10.1016/j.fcr.2008.05.007

Citation Data. CDS, NASA-POWER, MLA. IRI/LDEO Climate Data Library.

Annex 1: Heat Stress Index valuess of irrigated wheat production in lowland woredas in Afar and Somali regional states and South Omo zone of Ethiopia.



Annex 2: Group picture of participants involved in the development of the PCA at Adama, Ethiopia.