



Twenty Second Session of the ASEAN Climate Outlook Forum (ASEANCOF-22)
27 – 30 May 2024, DMH Lao PDR



Consensus Bulletin for June-July-August (JJA) 2024 Season

INTRODUCTION

The ASEAN Climate Outlook Forum (ASEANCOF) is an avenue to collaboratively develop consensus-based seasonal climate outlooks and related information on a regional scale. The forum's outlook and its activities contribute significantly to one of the key roles of the ASEAN Specialised Meteorological Centre (ASMC), which is to conduct climate and seasonal prediction for the Association of Southeast Asian Nations (ASEAN) region through pooling the expertise of ASEAN National Meteorological and Hydrological Services (NMHSs). In 2021, the ASEANCOF Working Group was established with the goal to guide and support the long-term development of ASEANCOF, in particular with regard to the implementation of objective outlooks.

The Twenty-Second session of ASEANCOF (ASEANCOF-22) was organised by the Department of Meteorology and Hydrology of Lao PDR, RIMES, the ASEANCOF Working Group, and WMO. Participants from the NMHSs of ASEAN Member States created a consensus forecast for the boreal summer monsoon 2024 in the ASEAN region. The consensus for the June-July-August (JJA) 2024 outlook was achieved through a hybrid session, which included presentations from different NMHSs, questionnaires, and discussions regarding the current climate conditions and predictions for Southeast Asia. There was also two-day pre-COF training, conducted by the UK Met Office under the WISER Asia Pacific project and RIMES. The theme of ASEANCOF-22 was Agriculture and Climate Services, with a focus on drought. On the last day of ASEANCOF-22, a sharing session was held which included presentations from UN ESCAP, FAO, and WFP, as well as discussion on ways to improve ASEANCOF. As a result of these discussions, outlook for maize and rice is included in Annex C.

CONDITIONS AND OUTLOOK

Recent analysis of sea surface temperature (SST) anomalies over the equatorial Pacific shows average to slightly below-average SSTs across the equatorial Pacific Ocean, and along with atmospheric indicators such as trade wind strength and cloudiness, indicate ENSO-neutral conditions. In the Indian Ocean, the Indian Ocean Dipole is also neutral.

The international climate outlook predicts that a La Niña is likely to develop sometime during JJA 2024. After JJA 2024, most models predict La Niña conditions to continue until the end of the year.

There is a chance that a weak positive Indian Ocean Dipole (IOD) may become established during JJA 2024 based on the model predictions. However, it is predicted to most likely be short-lived.

The onset of the Southwest monsoon season has been or is expected to be near average for much of Mainland Southeast Asia, apart from Thailand where the onset is later than average. The onset of the Southwest monsoon for much of the Maritime Continent has been or is expected to be near average. The strength of the Southwest monsoon is predicted to be near average over most of the Southeast Asia, based on model predictions.

During JJA 2024, tropical cyclone frequency is predicted to be below average around the Philippine Sea and the Bay of Bengal, and near average around South China Sea.

RAINFALL

For the upcoming boreal (Northern Hemisphere) summer season (JJA 2024):

Above-normal rainfall is predicted over northern Myanmar, parts of Cambodia and parts of the equatorial region, including Brunei Darussalam and middle part of East Malaysia. Near- to above-normal rainfall is predicted over southern Thailand, western part of East Malaysia, and the southern Philippines, as well as parts of Mainland Southeast Asia including western Myanmar, northwestern Lao PDR, parts of Cambodia, and southern Viet Nam.

Below-normal rainfall is predicted over the western part of Northern Philippines. Below- to near- normal rainfall is predicted over southern Lao PDR, the rest of Northern Philippines, and southernmost parts of Southeast Asia.

Elsewhere, near-normal rainfall is predicted.

TEMPERATURE

For the upcoming boreal (Northern Hemisphere) summer season (JJA 2024):

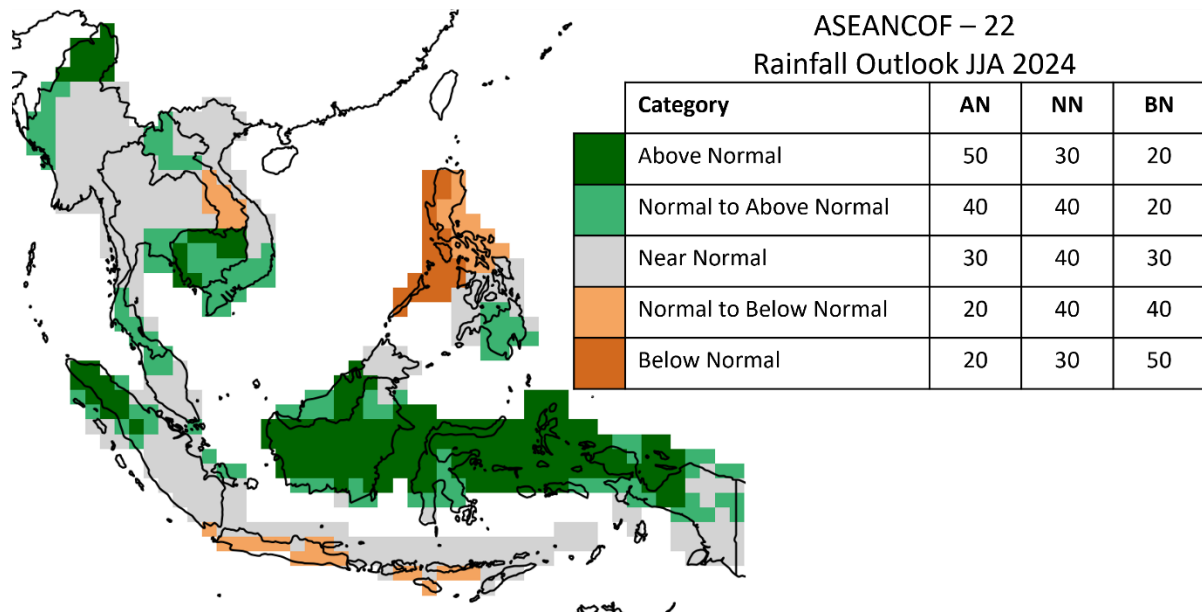
Above normal temperature is predicted over most of Southeast Asia, apart from over much of Myanmar, Lao PDR, Cambodia, Brunei Darussalam, and the Philippines where near- to above-normal temperature is predicted.

Refer to **Annex A** for reference on what is meant by “above, near, or below normal” in the outlook. For more information on the boreal (Northern Hemisphere) winter monsoon outlook and further updates on the national scale, the relevant NMHSs should be consulted (see **Annex D**).

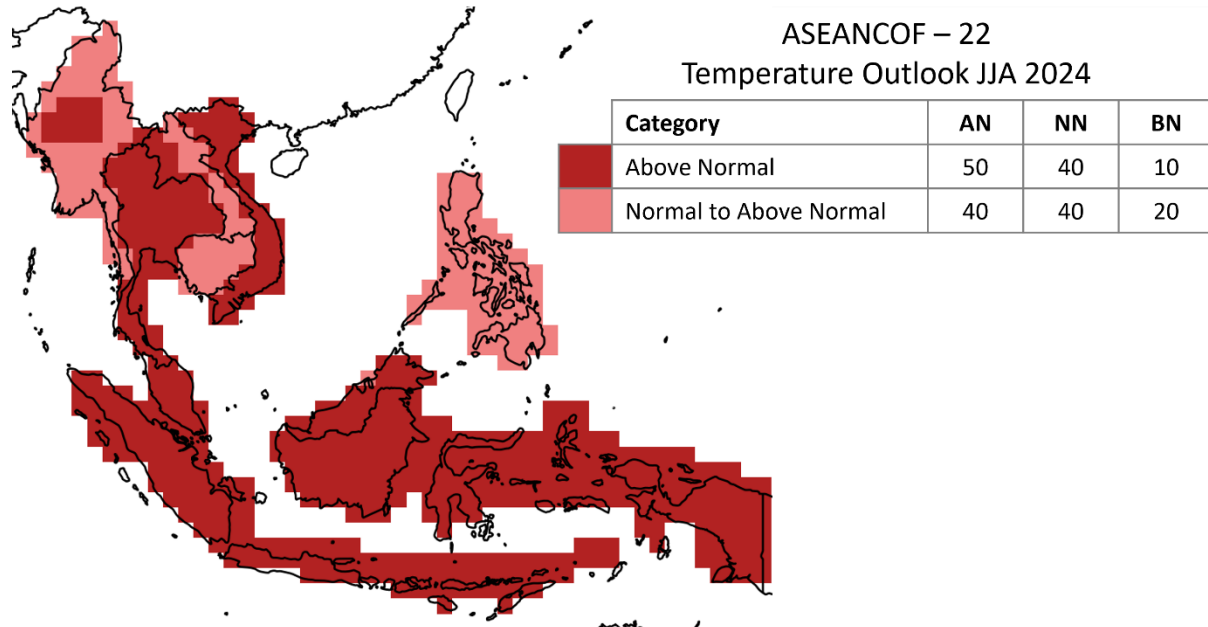
CONSENSUS MAPS FOR JJA 2024

The following maps provide the probabilistic outlooks for JJA 2024 season in terms of tercile categories of “Above Normal” (AN: upper tercile), “Near Normal (NN: middle tercile) and “Below Normal” (BN: lower tercile).

PROBABILISTIC RAINFALL OUTLOOK



PROBABILISTIC TEMPERATURE OUTLOOK



ACKNOWLEDGEMENTS

ASEANCOF would like to convey its appreciation to the NMHSs of the ASEAN Member States for sharing their national level forecasts, the Global Producing Centres, the Southeast Asia Regional Climate Centre – Network, RIMES, UN ESCAP, FAO, WFP, and other partners of ASEANCOF for sharing their products and expertise, and the World Meteorological Organization Regional Office in Asia and the Southwest Pacific (WMO-RAP) for their continued support of ASEANCOF. The Forum would also like to thank DMH Lao PDR for hosting the forum, with support from RIMES, and CREWS Cambodia and Lao PDR and WISER Asia Pacific for the funding support provided for the meeting.



In-person participants of ASEANCOF-22. ASEANCOF-22 was opened by H.E. Mr Chantaneth Boualapha, Vice-Minister of the Ministry of Natural Resources and Environment.

Annex A: Rainfall and Temperature Tercile Climatologies

ANNEX A: RAINFALL AND TEMPERATURE TERCILE CLIMATOLOGIES

The following figures include mean rainfall and temperature and tercile boundary climatologies to reference against the consensus outlook. Only a single source of data for each variable is provided: for rainfall CHIRPS (Funk et al. 2014) and for temperature ERA5 (Hersbach et al. 2019). For more representative climatologies, reference should be made also against observational datasets known to better characterize local patterns (e.g. quality-controlled station data from the respective NMHSs).

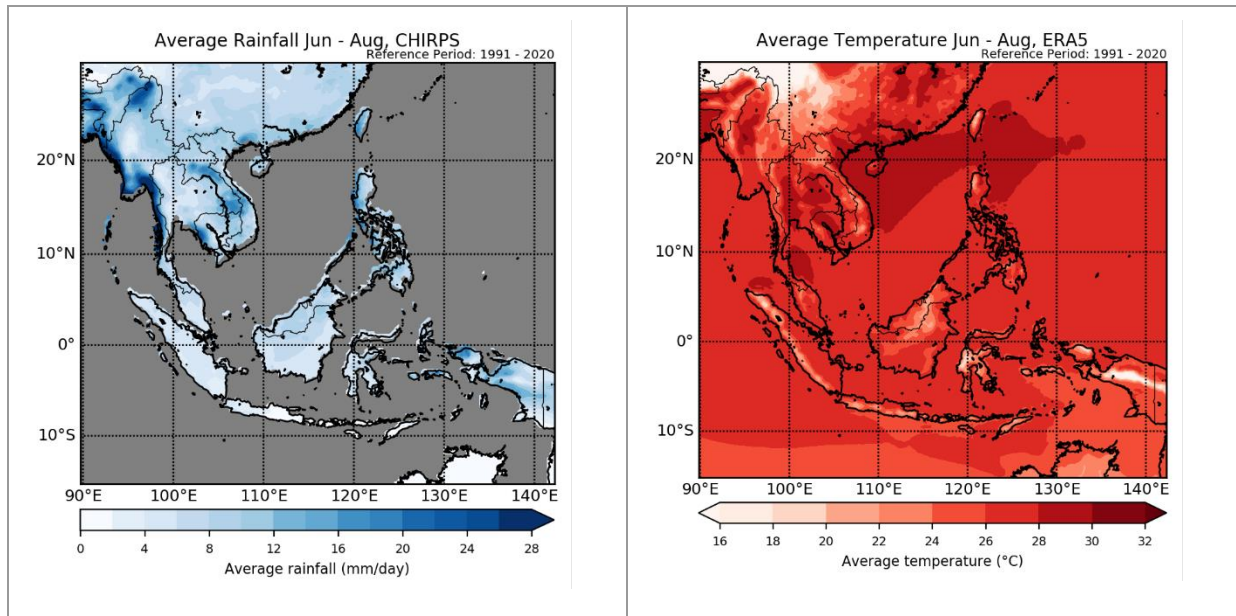


Figure A1: Mean rainfall (left, CHIRPS) and mean temperature (right, ERA5) for JJA for the climatology period 1991-2020.

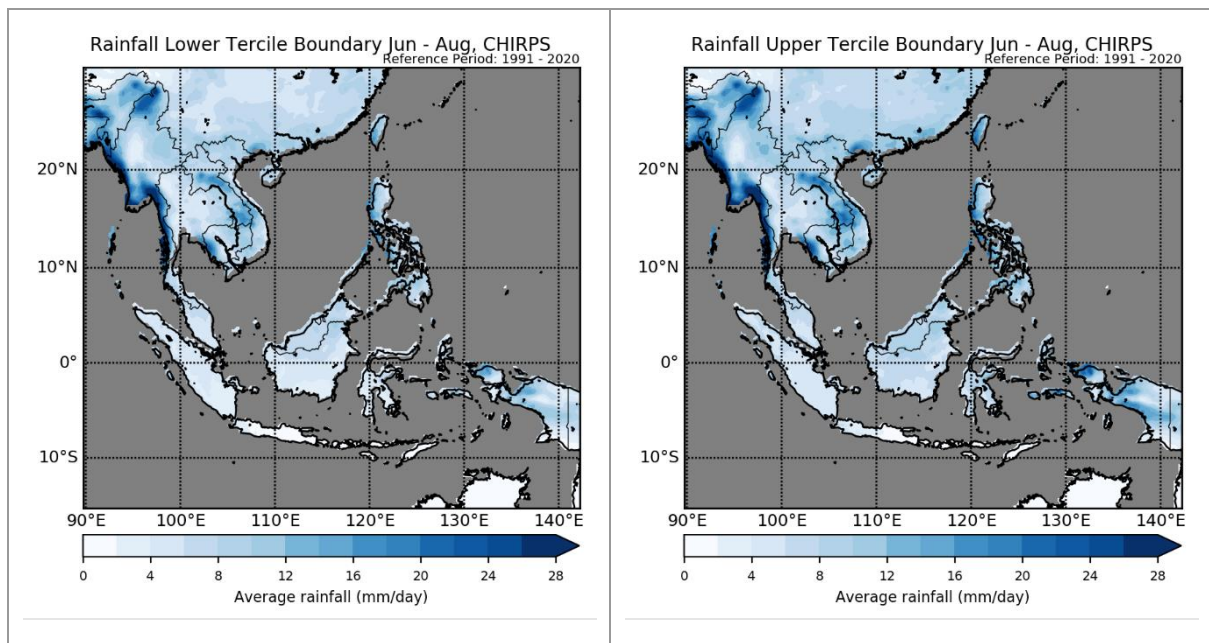


Figure A2: Rainfall climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for JJA from 1991-2020 using CHIRPS.

Annex A: Rainfall and Temperature Tercile Climatologies

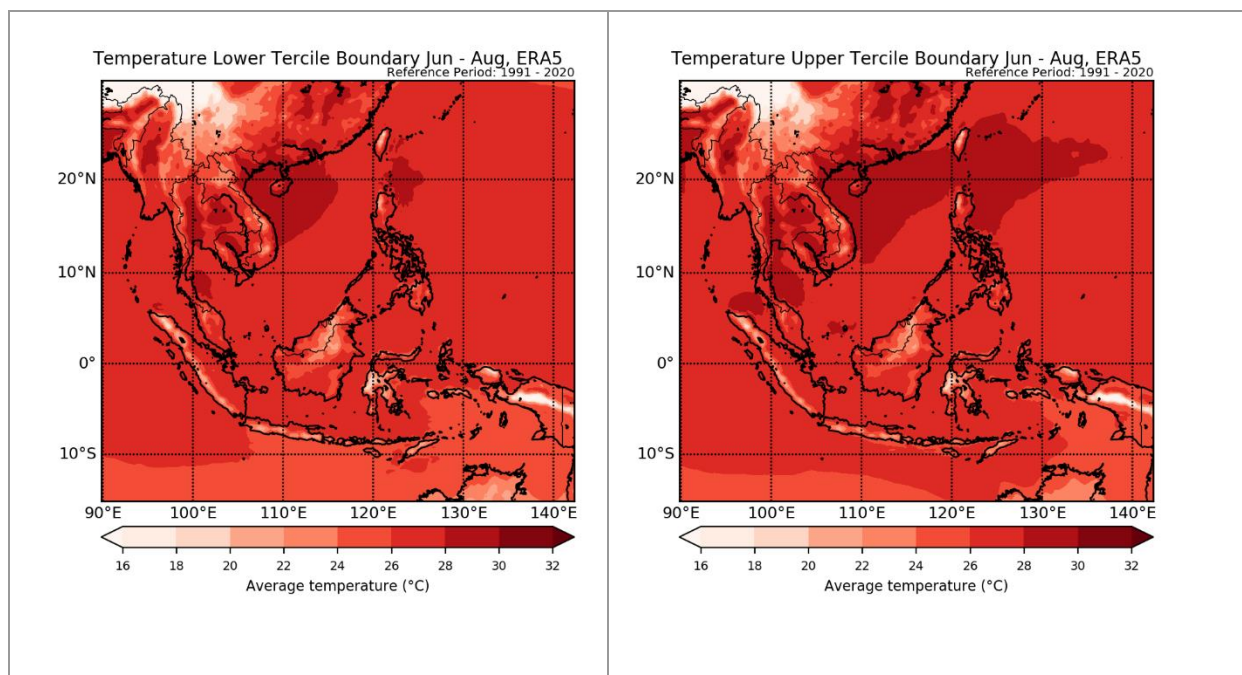


Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for JJA from 1991-2020 from ERA5.

ANNEX B: RAINFALL AND TEMPERATURE OUTLOOK FROM MODELS

The following figures show the starting point from the consensus discussion. From this point, NMHS representatives proposed changes, based on the typical impact during El Niño and IOD events, additional models (including statistical post-processed models), and assessment of model skill.

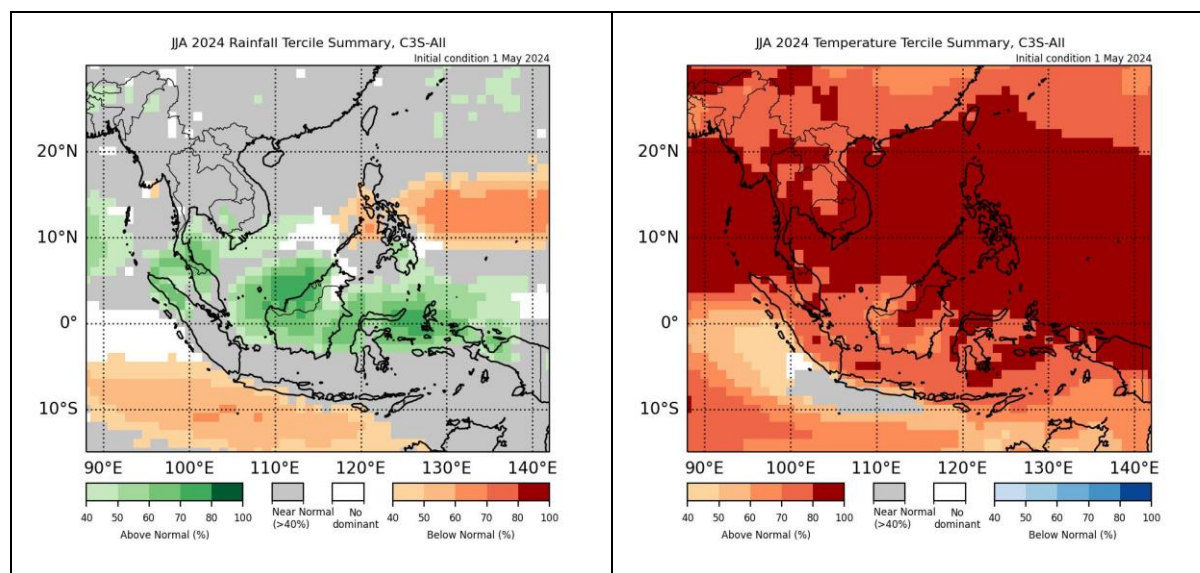


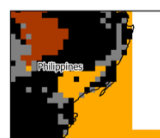
Figure B1: Outlook from the C3S seasonal models for JJA 2024 for rainfall (left) and temperature (right). The models used included NCEP, ECMWF, JMA, UK Met Office, DWD, CMCC and MeteoFrance.

Annex C: Agriculture Outlook from UN ESCAP

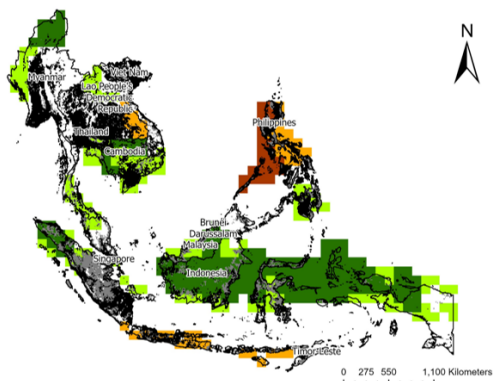
ANNEX C: AGRICULTURE OUTLOOK FROM UN ESCAP

In line with the theme of ASEANCOF-22: Agriculture and Climate Services, potential impact to rice and maize crops were prepared by UN ESCAP based on the ASEANCOF-22 rainfall consensus outlook.

Potential Rice crop exposure to BN rainfall



Rice production (metric ton)
0 - 10
10 - 500
500 - 117,640
Probability of AN rainfall
Near normal
Normal to Above Normal
Above Normal
Probability of BN rainfall
Near normal
Normal to Below Normal
Below Normal



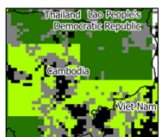
Sources: ASEANCOF-22 Seasonal Outlook Rainfall Data for June to August 2024, International Food Policy Research Institute (IFPRI) 2024, "Global Spatially-Disaggregated Crop Production Statistics Data for 2020 Version 1.0.0" and UN Geospatial

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations

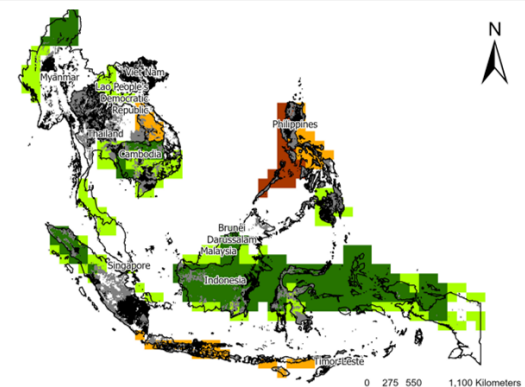
Country	Potential % exposure of Rice crop	
	Below normal	Normal to Below Normal
Brunei Darussalam	-	
Indonesia		32%
Cambodia		
Lao PDR		45%
Myanmar		
Malaysia		
Philippines	25%	42%
Singapore		
Thailand		2%
Timor-Leste		
Viet Nam		

For rice crop (above), analysis was done for potential risk to drought from below normal levels of rainfall. For most of the rice crop in SEA during this period will be in planting season and rice requires high quantities of [water](#). Growing rice in water offers best conditions for producing high yields and therefore potential drought at the planting stage may have severe implications for rice production in SEA.

Potential Maize crop exposure to AN rainfall



Maize production (metric ton)
0 - 10
10 - 500
500 - 171,775
Probability of AN rainfall
Near normal
Normal to Above Normal
Above Normal
Probability of BN rainfall
Near normal
Normal to Below Normal
Below Normal



Sources: ASEANCOF-22 Seasonal Outlook Temperature Data for June to August 2024, International Food Policy Research Institute (IFPRI) 2024, "Global Spatially-Disaggregated Crop Production Statistics Data for 2020 Version 1.0.0" and UN Geospatial

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Country	Potential % exposure of Maize crop	
	Above normal	Normal to Above Normal
Brunei Darussalam		
Indonesia	26%	4%
Cambodia	55%	45%
Lao PDR	1%	49%
Myanmar	2%	2%
Malaysia		3%
Philippines		46%
Singapore		
Thailand		3%
Timor-Leste		
Viet Nam		25%

For maize crop (above), analysis was done for potential risk to flooding from above normal levels of rainfall for the JJA season. Most of the maize crop in SEA during this period will be in [planting season](#) and maize crop is highly vulnerable to waterlogging especially at the early [seedling stage](#).

Annex D: National Meteorological Services' Contact Information

ANNEX D: NATIONAL METEOROLOGICAL SERVICES' CONTACT INFORMATION

- Brunei Darussalam Meteorological Department (BDMD)

<http://www.met.gov.bn/>

- Department of Meteorology, Cambodia

<http://www.cambodiameteo.com/map?menu=3&lang=en>

- Badan Meteorologi, Klimatologi dan Geofisika, Indonesia (BMKG)

<http://www.bmkg.go.id>

- Department of Meteorology and Hydrology (DMH), Lao PDR

<http://dmh.monre.gov.la/>

- Malaysian Meteorological Department (MMD)

<http://www.met.gov.my/>

- Department of Meteorology and Hydrology (DMH), Myanmar

<https://www.moezala.gov.mm/>

**- Philippines Atmospheric, Geophysical and Astronomical Services Administration
(PAGASA)**

<http://bagong.pagasa.dost.gov.ph/>

- Meteorological Service Singapore (MSS)

<http://www.weather.gov.sg/home/>

- Thai Meteorological Department (TMD)

<http://www.tmd.go.th/en/>

- National Center for Hydro-Meteorological Forecasting (NCHMF), Vietnam

<https://nchmf.gov.vn/KttvsiteE/en-US/2/index.html>

ANNEX E: REVIEW OF DJF 2023/2024 CONSENSUS OUTLOOK

SUMMARY

The rainfall outlooks were representative of the actual conditions over some parts of Southeast Asia whereas temperature outlooks were representative of actual conditions over most parts of Southeast Asia for December-January-February (DJF) 2023/2024. The region experienced a mix of below to above-normal rainfall during DJF 2023/2024, and predominately above-normal temperature.

In November, El Niño conditions were present as well as a positive Indian Ocean Dipole. The international climate outlooks predicted El Niño to gradually weaken, though condition to indicate El Niño conditions for much of the first half of 2024. The positive IOD was predicted to weaken and return to IOD-neutral over DJF 2023/2024.

Based on the assessment as part of ASEANCOF-21, [SEA RCC Climate Monitoring Node](#), and the [WMO El Niño/La Niña Updates](#), the DJF 2023/2024 period experienced El Niño conditions and transition from a positive Indian Ocean Dipole to neutral.

In the sections below, a combination of global gridded data and reviews by National Meteorological and Hydrological Services (NMHSs) was used to verify the outlook.

DJF 2023/2024 RAINFALL OUTLOOK

Over much of the Maritime Continent, below- to near-normal rainfall is predicted, apart from over the equatorial region, where a mix of below- to above-normal rainfall is predicted.

For Mainland Southeast Asia, a mix of near- to above-normal rainfall is predicted. Near- to above-normal rainfall is predicted over parts of northern and central Mainland Southeast Asia, while below- to near-normal rainfall is predicted mainly over western parts. Elsewhere over this region, near-normal rainfall is predicted.

A mix of below- to above-normal rainfall was observed over much of the ASEAN region as can be seen by CHIRPS rainfall in Figure E1. There is some agreement between the predicted and observed rainfall for the region.

Over northern ASEAN region, below-normal rainfall was recorded over southern Thailand and parts of the Philippines, in line with the outlook as well as typical response during El Niño. Elsewhere, there was a mix of below- to above-normal rainfall and less agreement with the outlook.

Over the southern ASEAN region, above-normal rainfall was recorded over parts of the western Maritime Continent in line with the outlook. Elsewhere, below- to near-normal rainfall was recorded, typical of a weak or moderate El Niño.

Based on the country reviews by NMHSs (Table E1), there was reasonable agreement between the outlook values averaged over the country and the observed values. The exception was for some parts of Mainland Southeast Asia (Table E1, in bold). There were some differences between the country reviews (based on rain gauge data) and the CHIRPS gridded product in Figure E1. Central and eastern Thailand and western and coastal parts of Cambodia observed near-normal rainfall based on the national level assessments, whereas rainfall was below-normal based on the CHIRPS dataset. Over Viet Nam, rainfall was below- to near-normal based on the national assessment, while rainfall was near- to above-normal based on CHIRPS.

Annex E: Review of DJF 2023/2024 Consensus Outlook

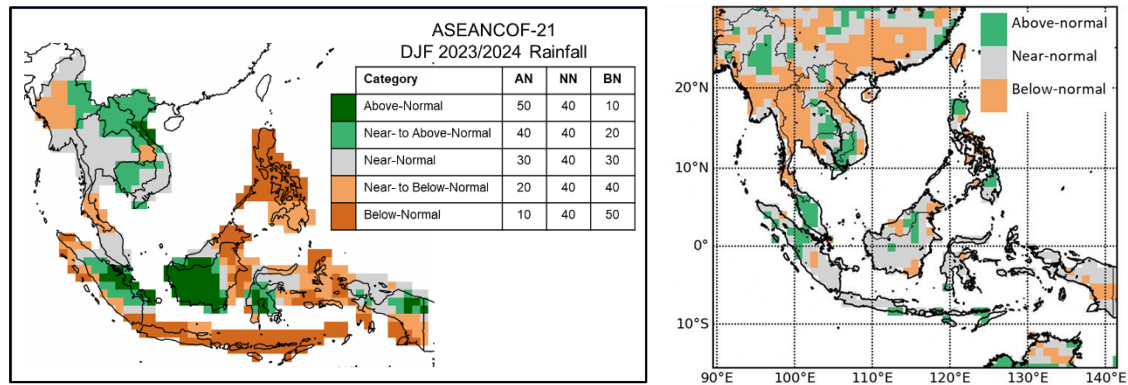


Figure E1: DJF 2023/2024 ASEANCOF outlook (left) observed DJF rainfall in terciles (right, climatology 1991-2020). The rainfall dataset is CHIRPS (Funk et al 2014).

Table E1: Observed Rainfall based on the national level assessment. The Most Likely Category from the ASEANCOF-21 outlook (MLC), the observed rainfall as noted by the NMHS (obs. tercile) are included. The tercile categories are above-normal (AN), near-normal (NN), and below-normal (BN). Bold texts highlights discrepancies between the outlook and observed.

Country	Outlook (MLC*)	NMHS OBS TERCILE
Brunei	BN – NN	NN
Cambodia	Western half, coastal: NN - AN Rest: NN	Western half, coastal: NN Rest: BN - NN
Lao PDR	Southern: NN - AN Rest: BN - NN	Southern: BN – NN Rest: BN – NN
Malaysia	Peninsular Malaysia: BN – NN East Malaysia: BN - NN	Peninsular Malaysia: NN – AN East Malaysia: BN
Myanmar	Western: BN - NN Eastern: NN - AN Rest: NN	Western: NN – AN Eastern: NN Rest: BN - AN
Philippines	Northern, central: BN Southern: BN - NN	Northern, central: BN Southern: NN
Singapore	NN-AN	AN
Thailand	Southern: BN - NN Central, eastern: NN Northern, northern: NN	Southern: BN Central, eastern: NN Northern, northeastern: BN
Viet Nam	Northern half: NN – AN Rest: NN	BN – NN

DJF 2023/2024 TEMPERATURE OUTLOOK

Near- to above-normal temperature is predicted over Southeast Asia. While above-normal temperature is predicted for most of the region, near-normal temperature is predicted over parts of northern and western Myanmar, and near- to above-normal temperature is predicted over parts of Lao PDR, Viet Nam, and the Philippines.

Most of ASEAN region experienced above-normal temperature, apart from over parts of Myanmar, and parts of the equatorial region where a mix of below- and near-normal temperature was recorded, based on the CPC Unified Gauge dataset (Figure E2). Overall, this is in good agreement with the outlook.

The results from NMHS country reviews (Table E2) also show predominantly near- to above-normal temperatures. There is good agreement between the outlook values averaged over the country and the observed values.

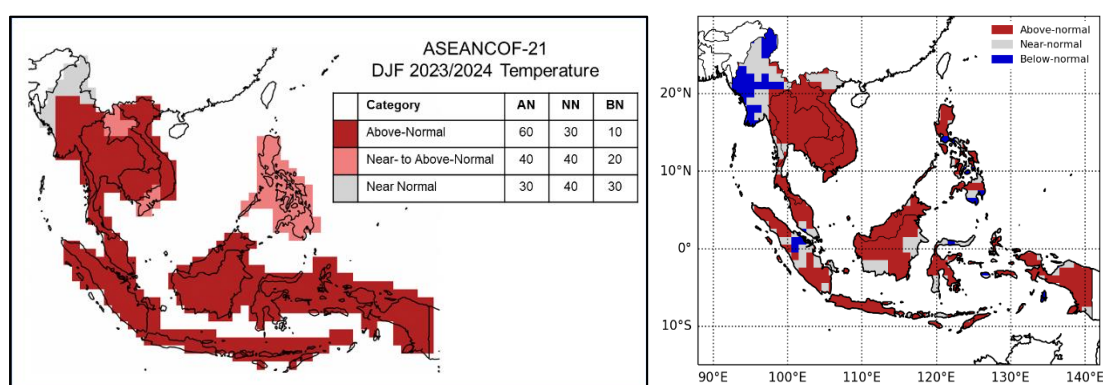


Figure E2: DJF 2023/2024 ASEANCOF outlook (left) observed temperature in terciles (right, climatology 1991-2020). The temperature dataset is CPC Unified Gauge (Chen et al 2008).

Table E2: Observed temperature based on the national level assessment. The Most Likely Category from the ASEANCOF-21 outlook (MLC), the observed temperature as noted by the NMHS (obs. tercile) are included. The tercile categories are above normal (AN), near normal (NN), and below normal (BN). Bold texts highlights discrepancies between the outlook and observed.

Country	Outlook (MLC*)	NMHS OBS TERCILE
Brunei	AN	AN
Cambodia	AN	AN
Lao PDR	Northern: NN – AN Rest: NN	Northern: AN Rest: AN
Malaysia	AN	AN
Myanmar	Northern, western: NN Rest: AN	Northern, western: BN – AN Rest: NN – AN
Philippines	NN – AN	NN – AN
Singapore	AN	AN
Thailand	AN	AN
Viet Nam	Southern: NN – AN Rest: AN	AN

Annex E: Review of DJF 2023/2024 Consensus Outlook

SIGNIFICANT EVENTS

There were several notable low pressure and rainfall-related events throughout the ASEAN region between June to August 2024. Brunei Darussalam experienced a severe flood event on 31 December, with 126.7mm of rain recorded in one day. February and March were dry (-81% and -92% below average), with a dry spell from 6 – 30 March resulting in numerous fires and poor air quality. Severe cyclonic storm Michaung led to new rainfall records at four stations in Myanmar. Monsoon floods and a few episodes of heavy rainfall occurred in Malaysia. Only one Tropical Cyclone entered the Philippines Area of responsibility in the DJF, which brought flood and landslides to the southeastern part of the country. In December, the flood event was reported in the eastern part of southern Thailand, caused by continuous heavy rain due to the presence of a low-pressure cell over Malaysia and the Strait of Malacca during 23-25 December 2023.

For the ASEAN region, extreme temperature events were reported during JJA 2024. Viet Nam had a number of record-breaking temperature events. In Myanmar, record maximum temperatures were recorded at 15 stations across the country. Malaysia experienced heatwaves events at the end of February 2024. In Lao PDR, while no records were broken, there were fewer cooler days than previous years.

REFERENCES

CHIRPS: Funk et al. 2014: A quasi-global precipitation time series for drought monitoring: U.S. Geological Survey Data Series 832, 4 p., doi:10.3133/ds832.

CPC Unified Gauge: Chen, M., W. Shi, P. Xie, V. B. S. Silva, V E. Kousky, R. Wayne Higgins, and J. E. Janowiak (2008), Assessing objective techniques for gauge-based analyses of global daily precipitation, J. Geophys. Res., 113, D04110, doi:10.1029/2007JD009132.

ERA5: Hersbach et al. 2019: Global reanalysis: goodbye ERA-Interim, hello ERA5. ECMWF Newsletter, doi:10.21957/vf291hehd7.