World Food Programme

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CHANGING LIVES

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Timor-Leste, Agro-climate Outlook/ Perspetiva Agro-klimátika

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Key Message

- The amount of precipitation over the country compared to preceding years was poor with a lower rainfall anomaly. Dryness through the Standardized Precipitation Index (SPI) can be found from the eastern part of the country in May.
- Drought can be found from some areas where the second planting season is waiting, thus examining the actual cropland and mitigation plan would be crucial as impacts thereof may culminate in harvest loss as farmers can't start the processes for the second planting because there is no water on the cropland at the moment.
- An increase in the unstable weather patterns including the coming dry season could negatively impact small scale farmers and people in vulnerable areas.
- According to the forecast from the International Research Institute (IRI) of Colombia University and the European Centre for Medium-Range Weather Forecasts (ECMWF), Timor-Leste is expected to experience a slightly increased chance of unusually wet compare to long term average (LTA) between July and September 2020.

The analysis is merely based on remote sensing data. Ground checks would thus be necessary to ensure coherence of satellite and field observed data such as that collected by the Ministry of Agriculture and Fisheries(MAF), National Directorate of Meteorology and Geophysics (DNMG), FAO and other relevant partners. More information about previous reports and WFP in general can be found at https://www.wfp.org/countries/timor-leste

While, more rainfall and vegetation info could also be found from Vulnerability Analysis Mapping(VAM)'s food security analysis platform

https://dataviz.vam.wfp.org/seasonal_explorer

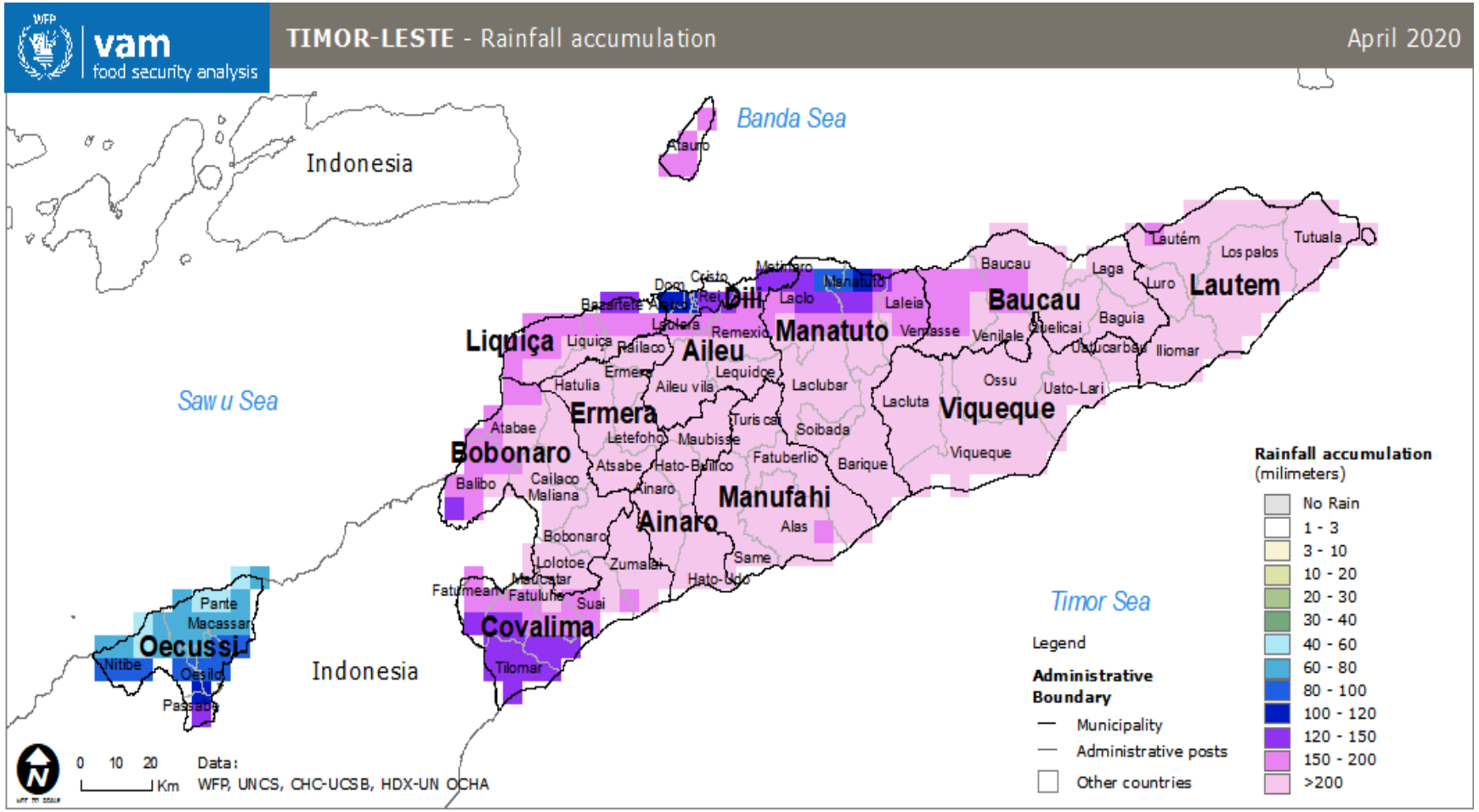
Mensajen Xavi

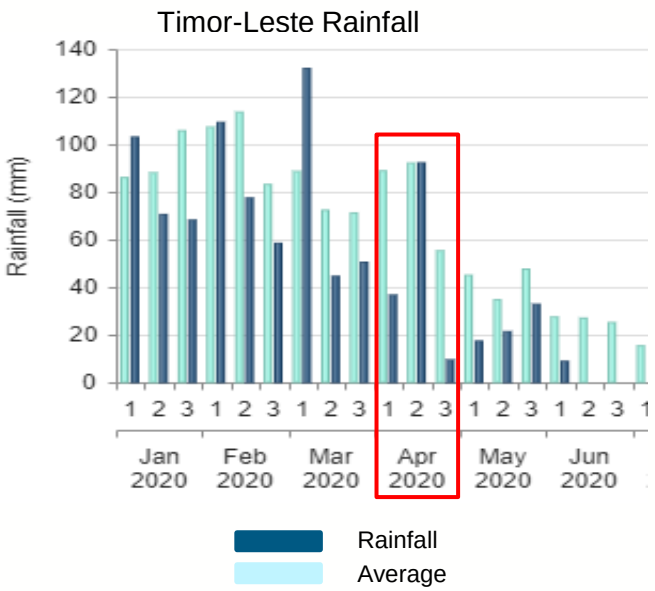
- Volume udan been iha teritóriu tomak kompara ho tinan hira kotuk liu-ba ladi'ak tanba anomalia volume udan ki'ik liu. Índise Presipitasaun Padronizadu (IPP) kona-ba bailoron bele haree hetan husi parte leste iha fulan Maiu.
- Bailoron bele haree hetan iha área balu durante tempu bainhira agrikultór sira hein hela atu kuda ai-han ba daruak, importante tebes bele ezamina kultivu atuál no planu mitigasaun tanba bele fó impaktu lakon kolleta tanba agrikultór sira la bele hahú prosesu kuda ai-han ba daruak sekarik laiha bee momentu kuda.
- Aumentu klima ne´ebé la estável inklui iha tempu bailoron oin mai bele fó impaktu negativu ba agrikultór eskala-ki'ik sira no ema iha área sira ne'ebé vulnerável.
- Tuir previzaun husi Institutu Internasionál Peskiza (IRI sigla Ingles) husi Universidade Colombia no Sentru Europeu ba Previzaun Tempu Médiu (ECMWF, sigla Ingles), Timor-Leste sei hetan aumentu udan uitoan kompara ho médiu tempu naruk (**long term average**) entre Jullu no Setembru 2020.

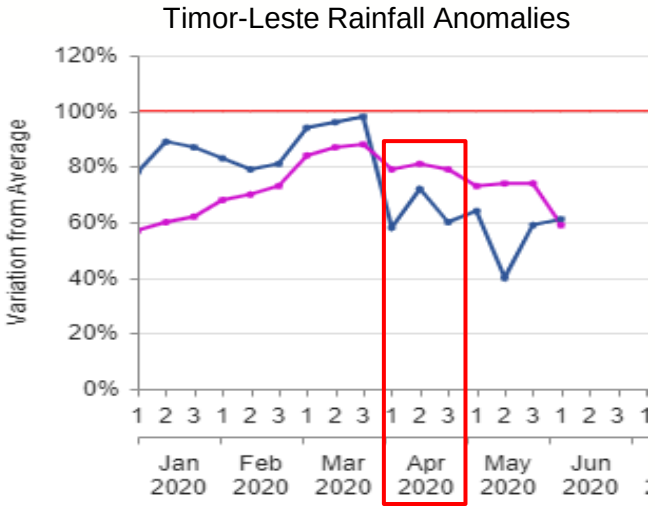
Análize bazeia de´it ba iha dadus detesaun remota. Tanba ne´e presiza kontrolu terrestre hodi asegura koerénsia dadus observadu liu husi satélite no rai rekolla husi Ministériu Agrikultura no Peska, Diresaun Nasional Meteorolojia no Geofízika, FAO no parseiru relevante seluk. Atu hetan informasaun kona-ba relatóriu uluk nian no WFP enjerál bele hetan iha **https://www.wfp.org/countries/timor-leste.**

Informasaun seluk kona-ba volume udan no vejetasaun bele hetan iha plataforma análise Vulnerabilidade Mapeamentu Seguransa Alimentár https://dataviz.vam.wfp.org/seasonal_explorer

Rainfall Accumulation, April 2020



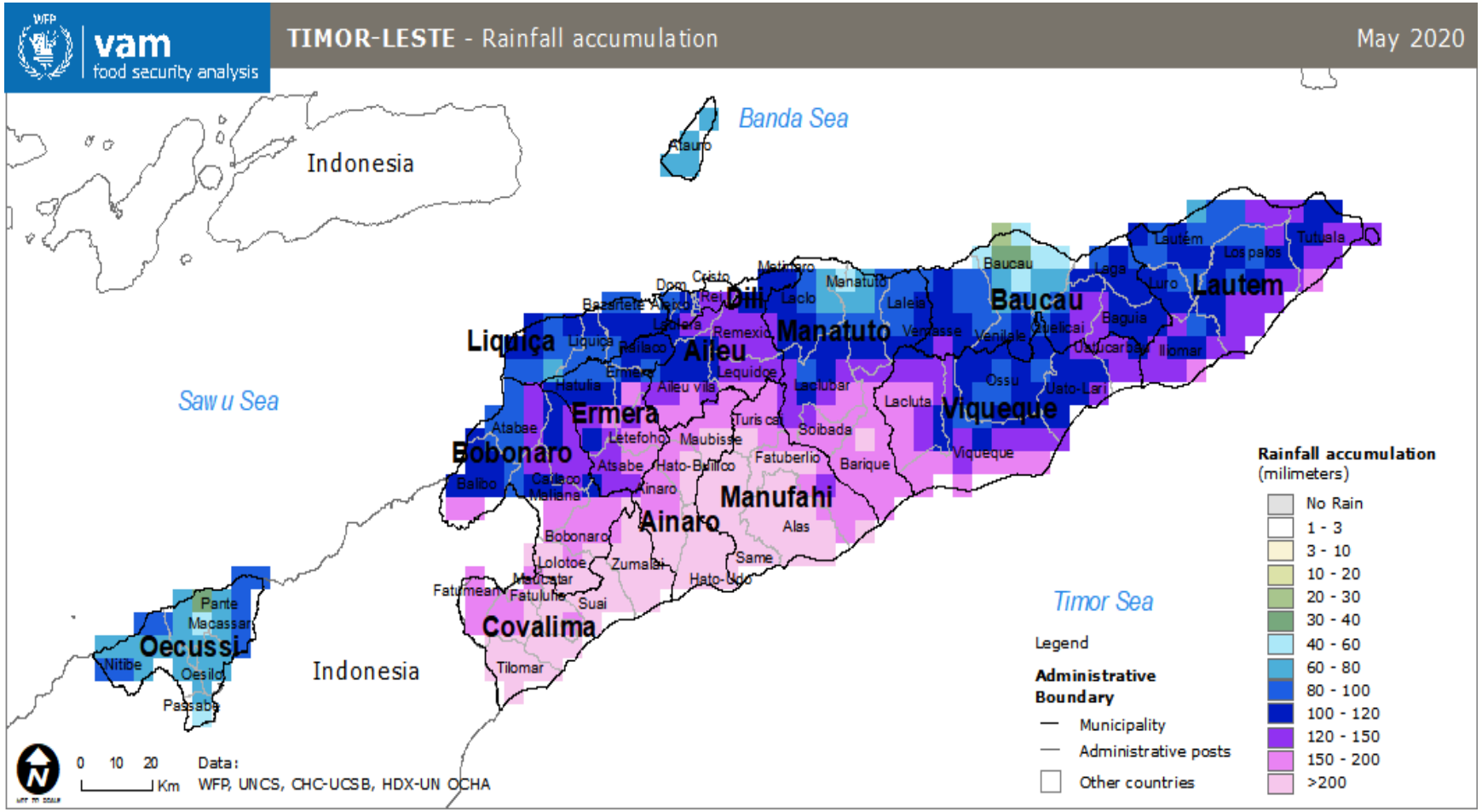


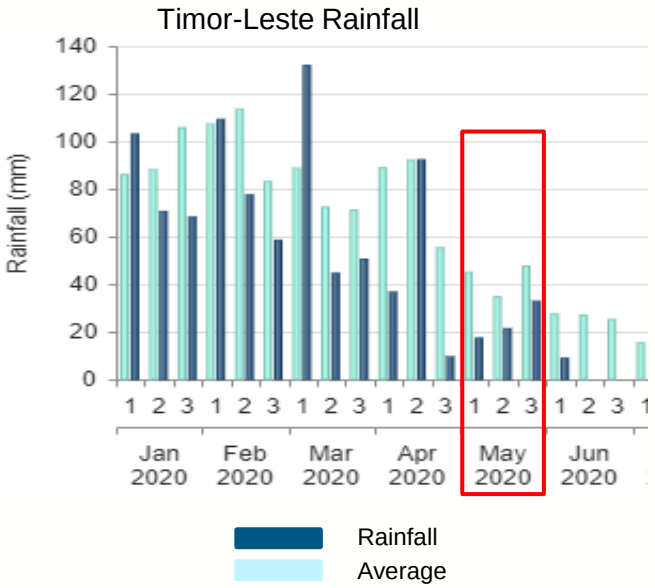


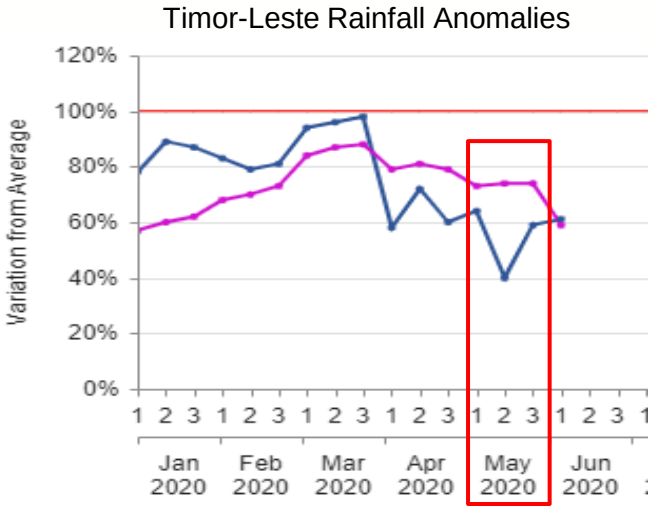
Despite receiving above 150mm of rainfall over the country shows that the rainfall accumulation is below average throughout the whole of April. It may seem to have experienced enough rainfall but, as depicted from the graph on the right side, the country is shown to have received 80% max of rainfall anomaly. However, there were exceptions notable with less rain in parts of Covalima, Dili, the upper part of Manatuto, and Oecussi which links to the Standardized Precipitation Index (SPI).

- **Dark blue: 1 Month anomaly**
- **Purple: 3 Months anomaly**

Rainfall Accumulation, May 2020

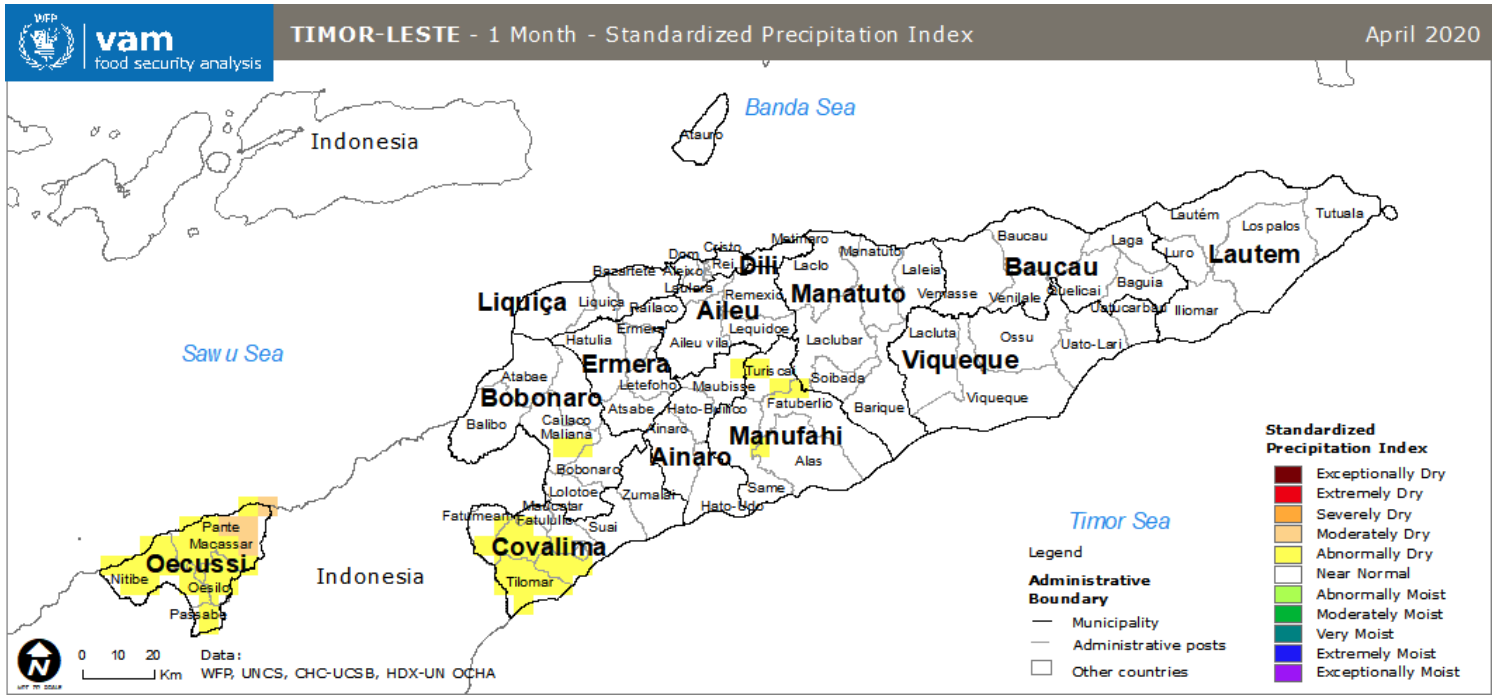


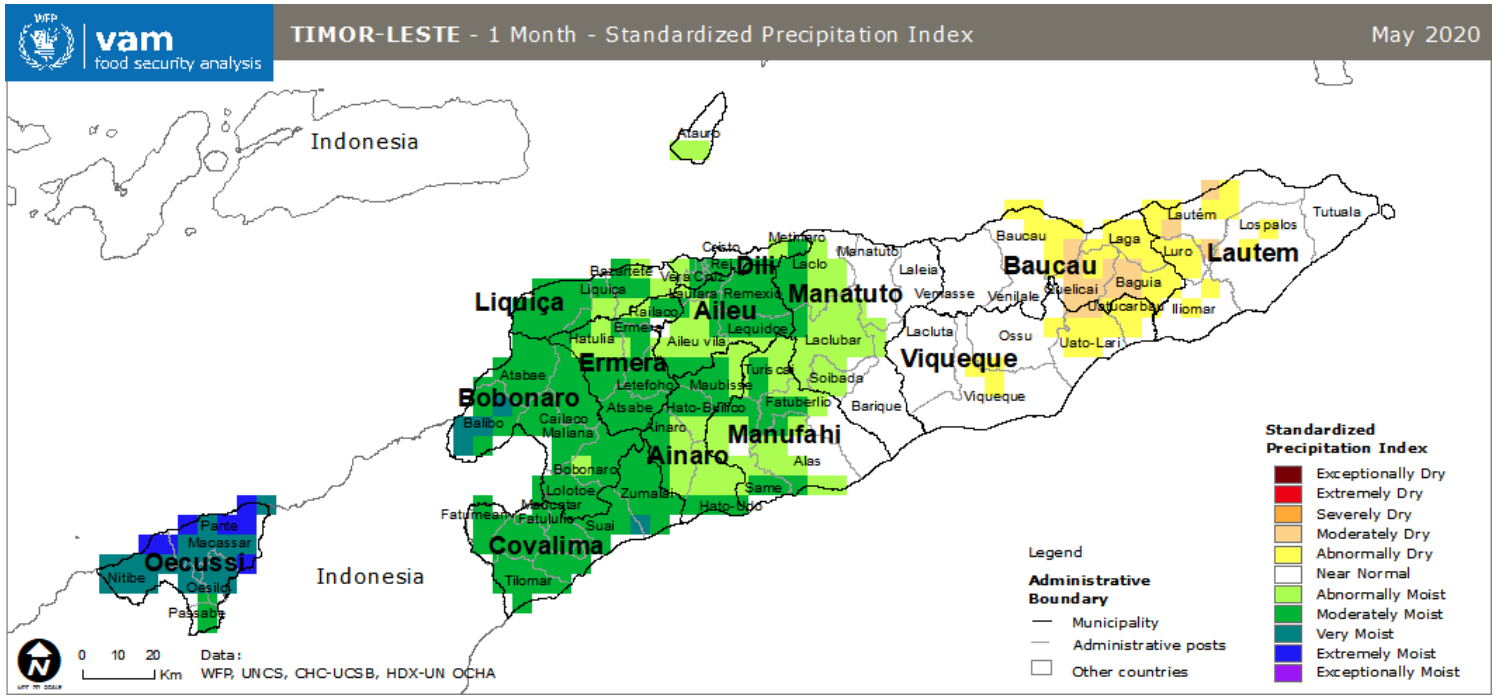




In May 2020, Timor-Leste in general experienced below normal rainfall except for Oecussi in the last dekad that only received 40 to 60% of rainfall than usual. However, it does not mean that the whole area is in dry condition.
The southern part of the country is depicted to have received over 150mm of rainfall. While, other places like Oecussi, Atauro, and Baucau experienced relatively lower rainfall. The rainfall anomalies for both 1 month and 3 months shown to have been way below than long term average and expect to be reflected in vegetation status in the coming months.

- **Dark blue: 1 Month anomaly**
- **Purple: 3 Months anomaly**





1-month Standardized Precipitation Index (April & May 2020)

On short timescales, the standardized precipitation index (SPI) generally indicates soil moisture. In April 2020, most areas of the country maintained a normal level (no drought) of SPI. However, a few places such as Tilomar and Fatululic in Covalima, Turiscai in Manufahi, and all the regions in Oecussi experienced abnormally dry. Some parts of Oecussi shown to have been moderately dry responding to the rainfall performance in April. Rainfall in Oecussi was below long term average through the whole month in April and it seems that it is reflected into SPI.

In May 2020, areas with dry conditions spread throughout the eastern part of the country compared to April. Some of the areas in Baucau, Lautem, and Viqueque experienced moderately or abnormally dry conditions corresponding to a decrease in absolute rainfall performance. On the contrary western part of the country and Oecussi showed to have been in moderately or abnormally moist conditions. Dryness in the eastern part of the country will likely be worse as the 'Dry season' begin and attention is needed accordingly.

Data: CHIRPS, CHG UCSB

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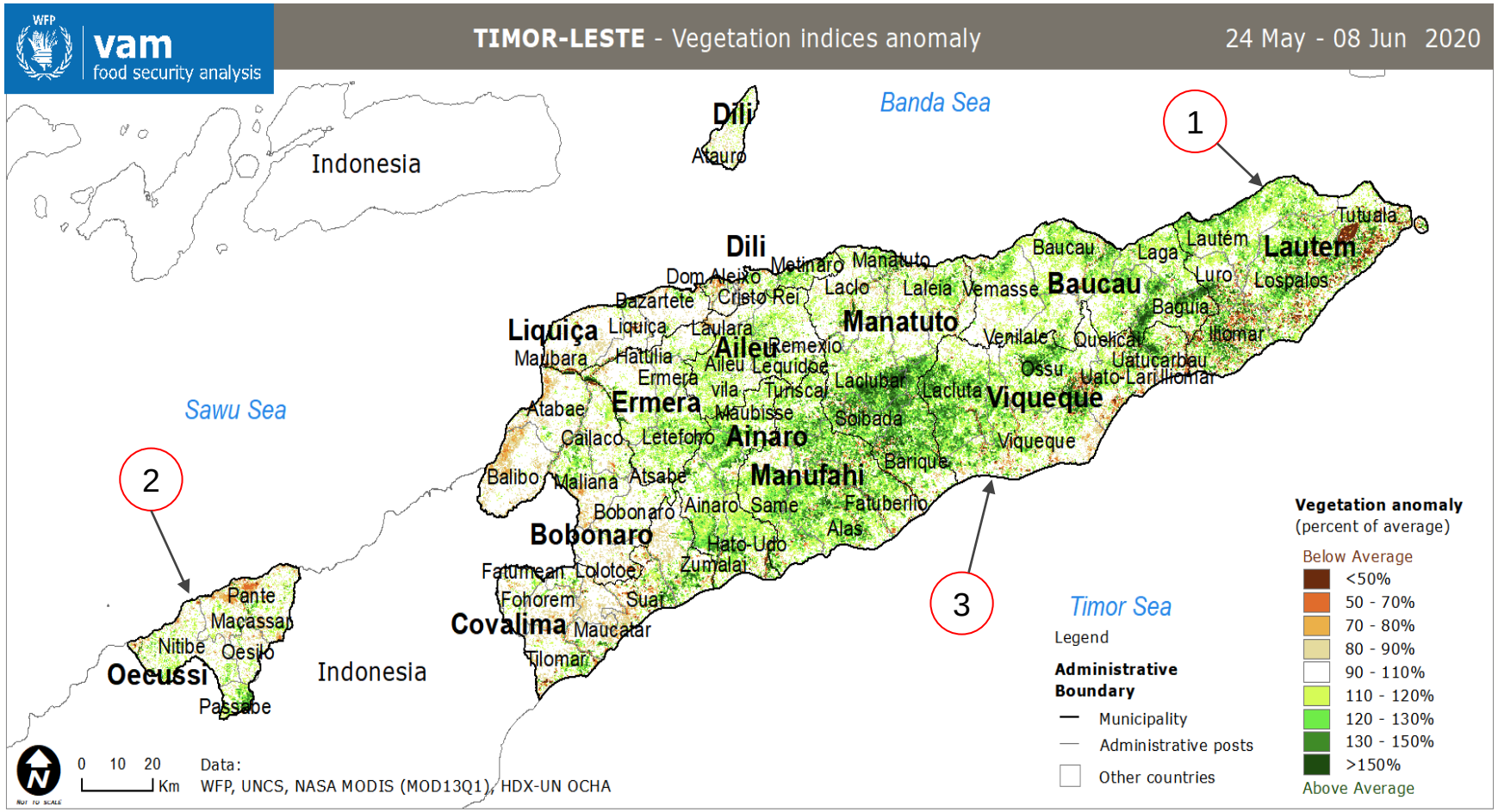
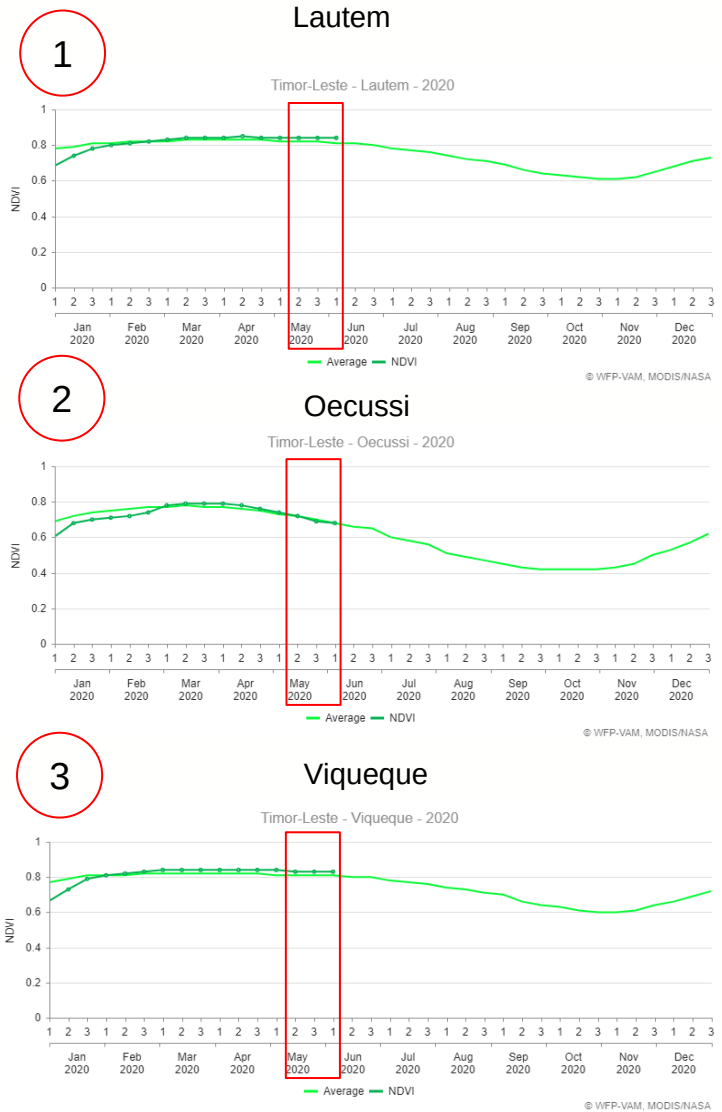
Vegetation status, 24 May – 08 June 2020



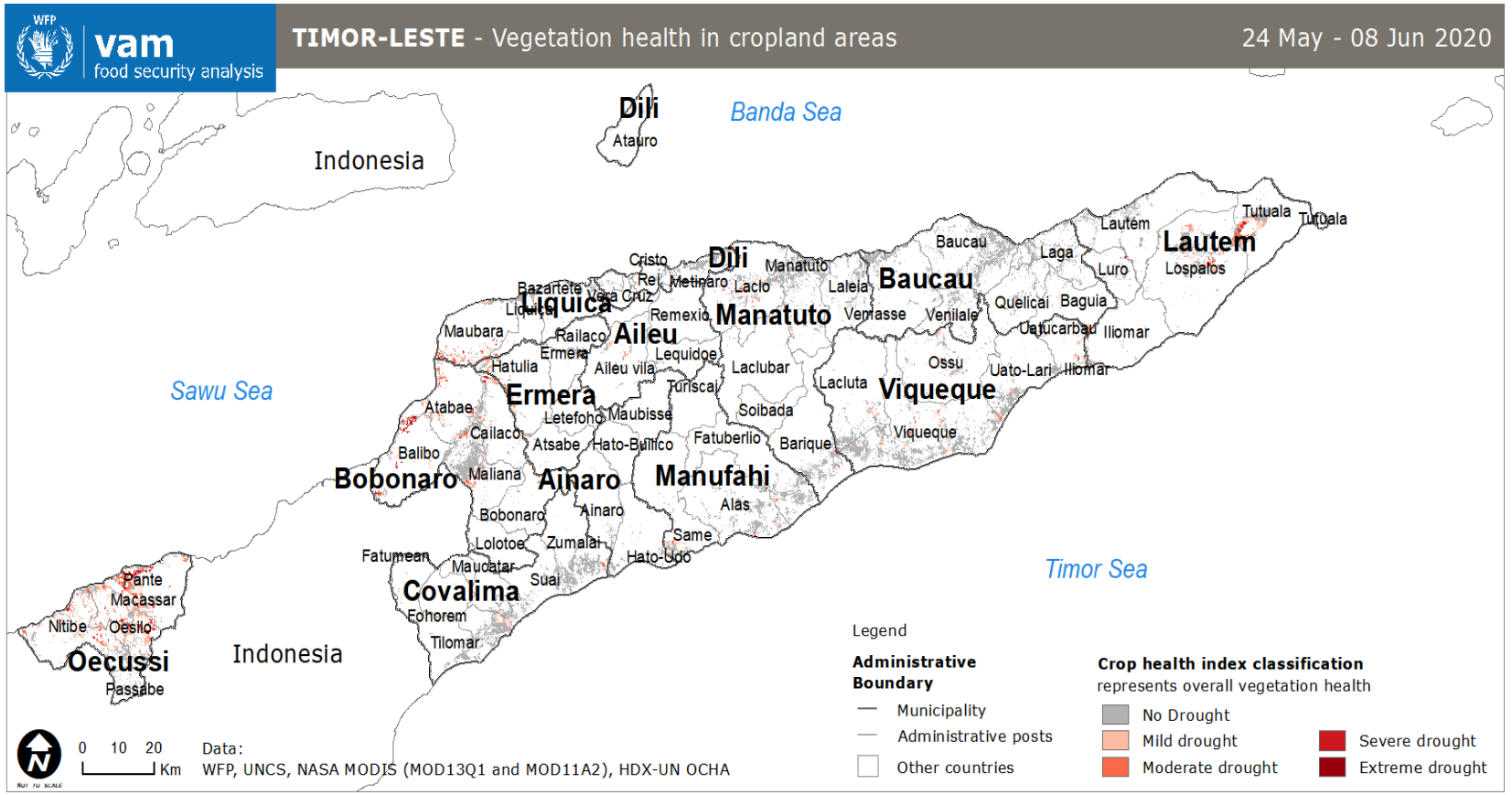


Despite poor rainfall performance than the average throughout May 2020, normal or the greenness vegetation is captured in most of the region. Corresponding to rainfall performance, the southern part of the country shown to have a stronger level above the average.

Below average is spotted in some areas such as Pente in Oecussi and Tutuala in Lautem. While this phenomenon could be attributed to other factors beyond the scope of this analysis, there was generally lower rainfall observed in these locations.

- **Dark green: current vegetation index**
- **Light green: long term average (LTA) NDVI**

Vegetation Health in Cropland Areas, 24 May – 08 June 2020



Seasonal crop calendar in Timor-Leste

In normal years, farmers usually began farming for the first season in November and doing the harvest in March. The second planting season begins in May and harvest takes place in September. The first season for rice planting began in December and harvested in April then for the second planting season begun in May and harvested in September.

Municipality	Jan	Feb	Mar	Apr	May	Jun
Aileu						
Ainaro						
Baucau						
Bobonaro						
Covalima						
Dili						
Ermera						
Lautem						
Liquica						
Manatuto						
Manufahi						
Oecussi						
Viqueque						

Municipality	Jul	Aug	Sept	Oct	Nov	Dec
Aileu						
Ainaro						
Baucau						
Bobonaro						
Covalima						
Dili						
Ermera						
Lautem						
Liquica						
Manatuto						
Manufahi						
Oecussi						
Viqueque						

Source: MAF-Seed of Life

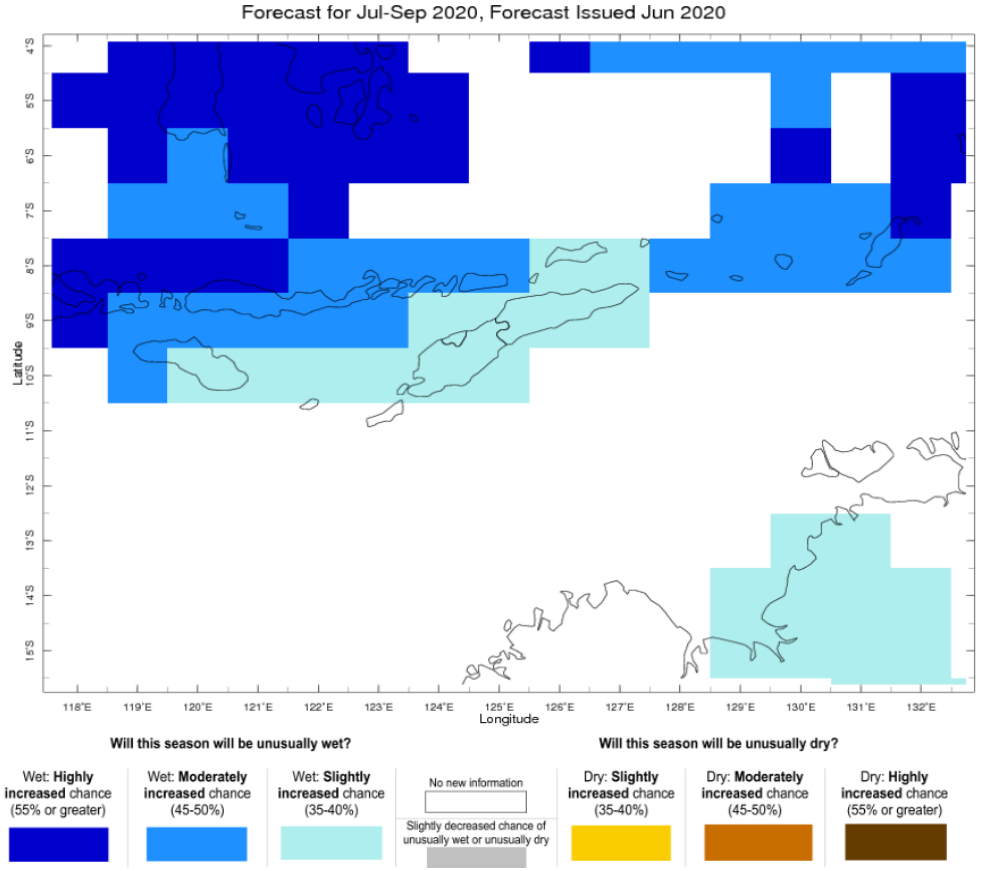
	Maize first season [planting]		Rice first season [planting]
	Harvest first season		Harvest first season
	Maize second season [planting]		Rice second season [planting]
	Harvest second season		Harvest second season
	Vegetative Phase		

The Vegetation Health Index (VHI) combines two components: deviations in land surface temperature and the extent to which vegetation density varies from normal patterns. The VHI depicts stress on vegetation and can be used to assess potential crop losses.

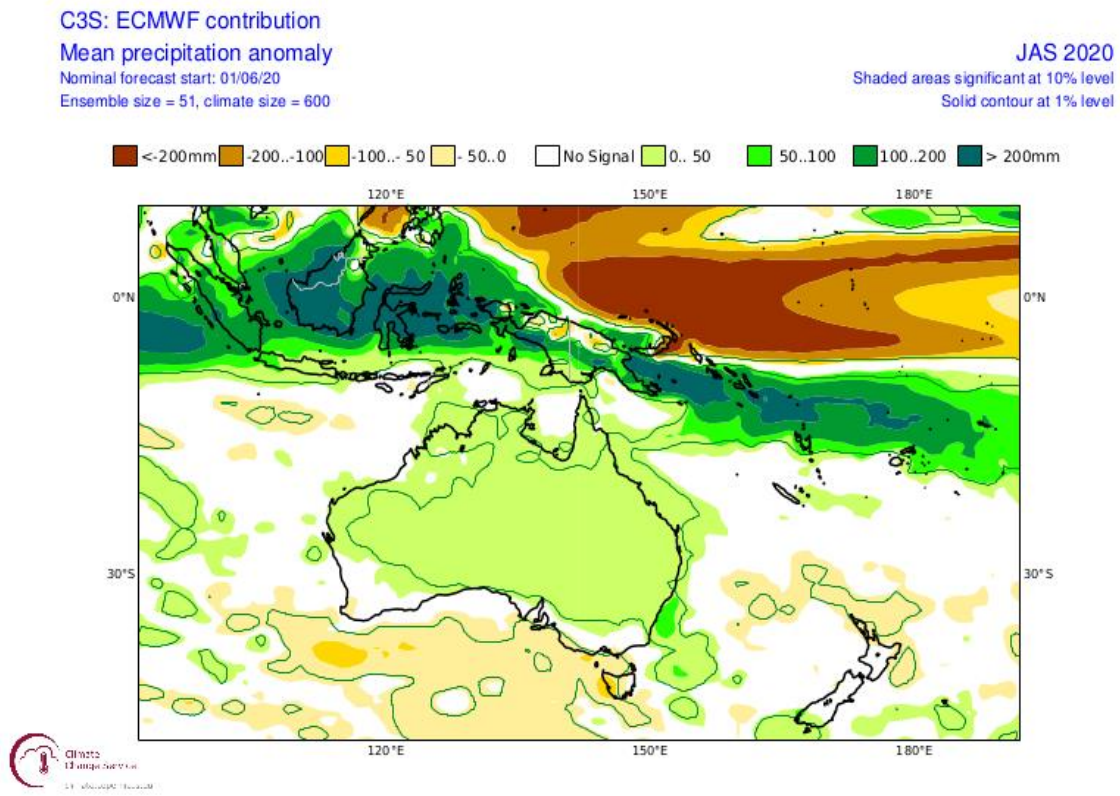
Baucau and Bobonaro are in second rice planting season and as seen from the map, some part of cropland in Bobonaro is in severe and moderate drought. While Covalima is also at the stage of the second maize planting season which mighty also delay. The delay in farming is due to the drought in these areas as many farm-land do not currently have water to help farmers start the processes for their second planting.

Further analysis of the actual crop primary productivity (Gross and Net Primary Productivity) is beyond the scope of this analysis but would be a valuable foundation to examine the influence of climatic parameters on the croplands in Timor-Leste.

Rainfall outlook, July – September 2020



IRI Columbia University. Source: http://iridl.ldeo.columbia.edu/maproom/IFRC/FIC/prcp_fcst.html?bbox=bb%3A113.617%3A-15.014%3A133.930%3A-2.991%3Abb



ECMWF. Source: https://climate.copernicus.eu/charts/c3s_seasonal/c3s_seasonal_spatial_ecmf_rain_3m?facets=Parameters,precipitation&time=2019120100,744,2020010100&type=ensm&area=area07

In general, the Colombia University International Research Institute (IRI) and the European Centre for Medium-Range Weather Forecasts (ECMWF) predict unusually wet conditions compare to Long Term Average (LTA) over Timor-Leste between July and September 2020. All areas in the country are projected to experience a slightly increased chance of rainfall.

However, these forecasts show only the likelihood of a 3-month accumulated rainfall being unusually high or low and do not indicate chances of individual heavy rainfall events. The forecasts apply over large areas only, and should not be used to forecast local conditions, or as a flood forecast.

Methodology and Data

Method

The maps in this bulletin are largely based on satellite data which is the processed and used to create various indicators related to climate and vegetation.

Meteorological drought happens when the actual rainfall in an area is significantly less than the climatological mean for that area. Meteorological drought can be monitored using indicators such as:

- Rainfall anomaly - a measure of lack of rainfall in a period compared to the average;
- Standardized Precipitation Index (SPI) - a normalized index representing the probability of occurrence of an observed rainfall amount when compared with the rainfall climatology over a long-term period. Negative SPI values represent rainfall deficit, whereas positive SPI values indicate rainfall surplus. Drought, according to the SPI, starts when the SPI value is equal or below -1.0, and ends when the value becomes positive. Reference: SPI http://www.wamis.org/agm/pubs/SPI/WMO_1090_EN.pdf and SPI classification came from https://droughtmonitor.unl.edu/About/AbouttheData/DroughtClassification.aspx
- The number of consecutive dry and wet days is also calculated as the count of the most recent days since a day had more/less than 1mm of rain. CHIRPS data is then processed to determine the number of days since the last rainfall (were a day with rainfall is noted as one where more than 1 mm of precipitation as observed). Using a standard classification, drought or wet level is then determined.

Agriculture drought is a situation where rainfall and soil moisture are inadequate during the crop growing season to support healthy crop growth to maturity, causing crop stress and wilting. Agriculture drought can be monitored using these indicators:

- Normalized Difference Vegetation Indices (NDVI) and or Enhanced Vegetation Index (EVI) anomaly: a measure of lack of greenness vegetation in a period compared to the average;

- Vegetation health index (VHI): is based on a combination of Vegetation Condition Index (VCI) and Temperature Condition Index (TCI). In Timor-Leste, the VCI is constructed using the Enhanced Vegetation Index (EVI). EVI is used instead of NDVI as it is more sensitive to changes in areas having high biomass, it reduces the influence of atmospheric conditions on vegetation index values, and it corrects for canopy background signals. The VHI is effective enough to be used as proxy data for monitoring vegetation health, drought, moisture, thermal condition, etc.
- The vegetation health also based on MODIS vegetation indices MOD13Q1 and land surface temperature MOD11A2 using the approach from https://journals.ametsoc.org/doi/pdf/10.1175/1520-0477%281997%29078%3C0621%3AGDWFS%3E2.0.CO%3B2

Data

Rainfall

- Daily precipitation from 1981 - now, 0.05deg ~ 5.6km spatial resolution. Source: CHIRPS CHC UC Santa Barbara - https://www.chc.ucsb.edu/data/chirps
- Forecast for Daily 5-day, 10-day, 15-day. 0.05deg ~ 5.6km spatial resolution. Source: CHIRPS-GEFS https://www.chc.ucsb.edu/data/chirps-gefs
- Seasonal (3 month) Forecast. Source: IRI Columbia University and ECMWF http://iridl.ldeo.columbia.edu/maproom/IFRC/FIC/prcp_fcst.html?bbox=bb%3A113.617%3A-15.014%3A133.930%3A-2.991%3Abb https://climate.copernicus.eu/charts/c3s_seasonal/c3s_seasonal_spatial_ecmf_rain_3m?facets=Parameters,precipitation&time=2019120100,744,2020010100&type=ensm&area=area07
- Rainfall and vegetation charts for every 10 and 16 days. Source: https://dataviz.vam.wfp.org/seasonal_explorer/rainfall_vegetation/visualizations

Vegetation

- Enhanced Vegetation Index (EVI), MOD13Q1. 16 days temporal resolution from 2000 - now, 250m spatial resolution. Source: MODIS Terra, USGS https://lpdaac.usgs.gov/products/mod13q1v006/

Temperature

- Land Surface Temperature, MOD11A2. 8 days temporal resolution from 2000 - now, 1km spatial resolution. Source: MODIS Terra, USGS https://lpdaac.usgs.gov/products/mod11a2v006/

Cropland extent

- GFSAD30E, Cropland extent 30m V001. Source: https://croplands.org/gfsadce30info

Population density and footprint

- Global Human Settlement Layer, 250m spatial resolution. Source: Joint Research Centre - EU https://ghsl.jrc.ec.europa.eu/download.php

WFP Climate and Food Security Analyses

The United Nations World Food Programme (WFP) works to save lives in emergencies and aims to change lives for millions through sustainable development. WFP works in more than 80 countries around the world, feeding people caught in conflict and disasters, and laying the foundations for a better future. WFP has been present in Timor-Leste since 1999 and is a committed partner of the government in combating all forms of malnutrition and achieving Sustainable Development Goals 2 for Zero Hunger by 2030.

With the advent of more frequent and intense climate change-induced disasters, people's ability to produce, access, and consume food could be greatly hampered. Moreover, the rural populations and vulnerable groups; including female-headed households and those with limited access to land, productive assets, or education stand the highest risk. Therefore, a profound understanding of the associated impacts of climate change on food security can inform relevant action and enhance the ability of governments and communities to prepare for or adapt to the adverse effects of climate change. It is upon this background, that the World Food Programme (WFP) produces this Agro-climate outlook for Timor-Leste.

WFP World Food Programme

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