World Food Programme

SAVING LIVES
CHANGING LIVES

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Timor-Leste, Agro-climate outlook/ Perspetiva Agro-klimatica

Ver3. March 2020

Contents

Key messages

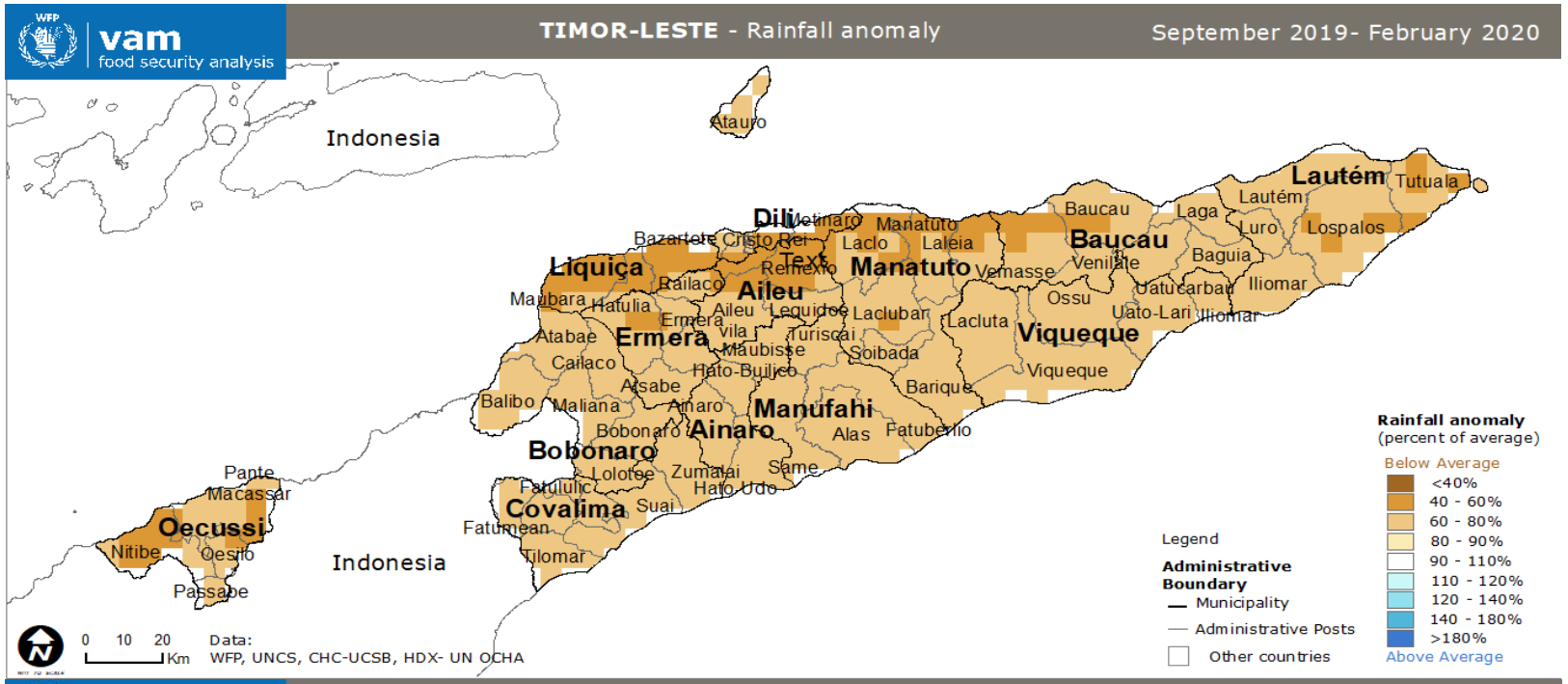
- Despite having received low rainfall for most of the year in 2019, the country has received increasing rain with variations in accumulation over the different dekads in January and February 2020.
- Compared to preceding years, the current rainy season had a slow onset. Examining the delay in the planting season would thus be crucial as impacts thereof may culminate in harvest loss.
- Following the previous dry spell, the recent and current rains should be a good sign for cultivation in various parts of the country as depicted in the Vegetation Health Index.
- According to the forecast from IRI-Columbia University, Timor-Leste will not experience unusually dry or wet conditions except for Oecussi which is predicted to experience slightly increased conditions of dryness.
- Fall Army Worm (FAW): There was a reported outbreak of the FAW in Liquica and Baucau. The FAW is known to be highly migratory, and thrive in warm and wet conditions. However, there is no concrete information on the cause and dispersion of the FAW in Timor-Leste. As such, the Ministry of Agriculture and Fisheries (MAF) is planning a rapid assessment through 6 carefully selected municipalities to ascertain the FAW situation and its potential impact in Timor-Leste.

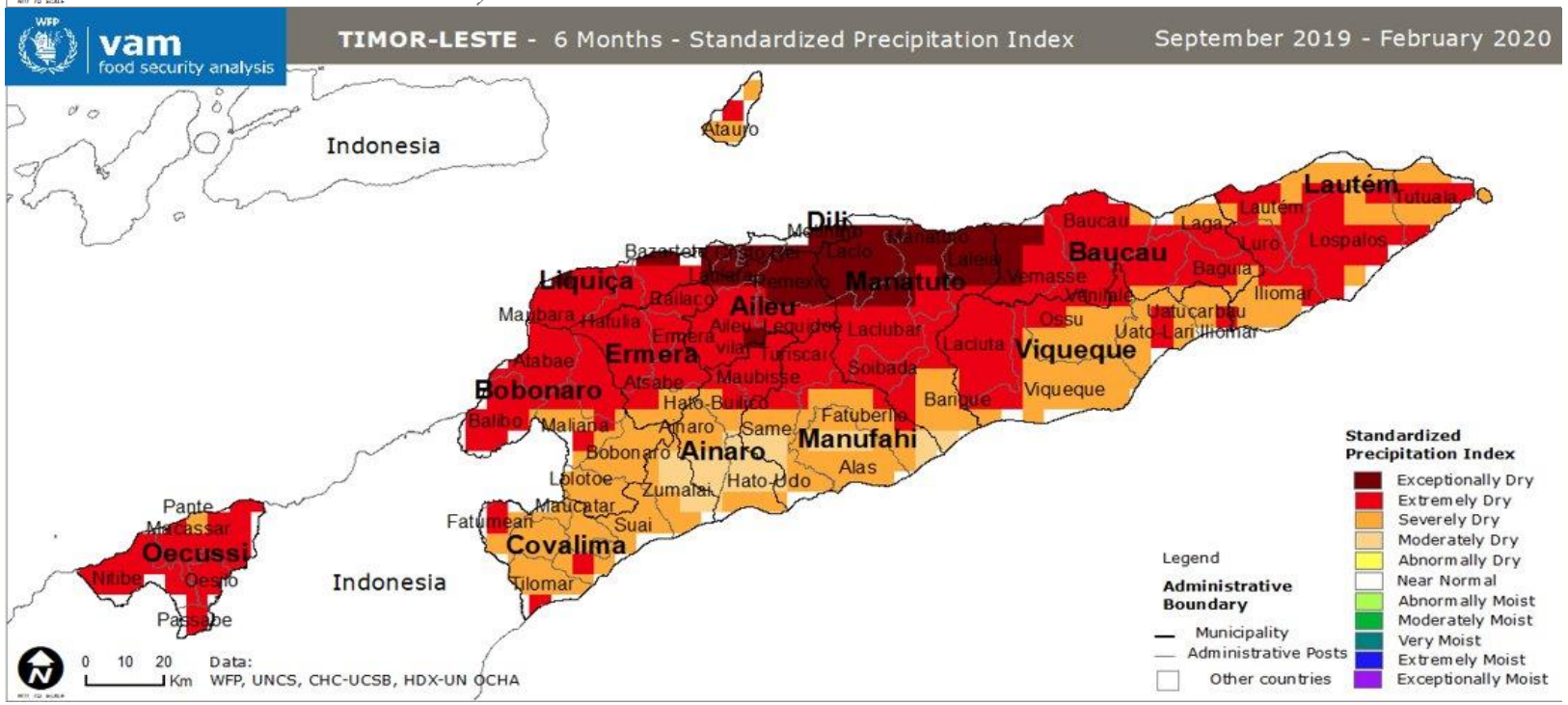
The analysis is merely based on remote sensing data. Ground checks would thus be necessary to ensure coherence of satellite and field observed data such as that collected by MAF, National Directorate of Meteorology and Geophysics (DNMG), FAO and other relevant partners. More information about previous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

Mensajen Savi

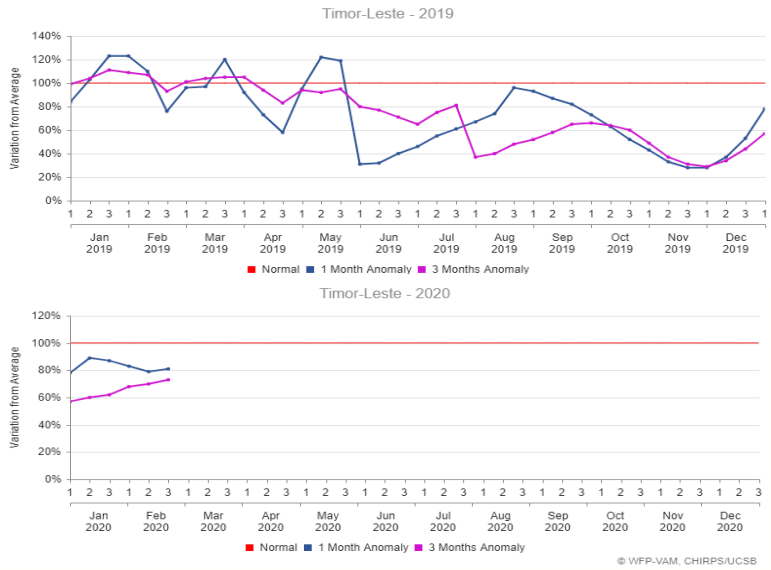
- Mesmu ho udan been ne'ebe menus kuaje iha tinan tomak 2019, maibe iha tinan 2020 iha Timor-Leste hetan udan been diak mesmu iha akumulasaun variasaun kompara ho tinan hirak ba kotuk iha fulan Janeiru no Fevereiru 2020.
- Kompara ho tinan hirak kotuk, udan been tinan nee ladun makaas ne'ebe afeta plantasaun tarde no la tuir nia tempu no ikus la fo resultadu kultivasaun ho diak. Examinasaun tarde ba halo planta tarde Iha nia tempu ne'be krusial no sei afeita ba iha tempu koileta produsaun ne'ebe mak lakon.
- Hafoin de tempu bailoron, udan ida foin lalalis ne no agora ne tuir lolos ne sai hanesan sinal diak ida ba Timor-Leste hodi halo kultivasaun oi-oin iha fatin hotu-hotu, hanesan hatudu ona liu husi indeks Vegetasaun Saude nian.
- Bajeia ba previsaun husi IRI, Timor-Leste sei la experiensia Kondisaun rai maran ou bokon ne'ebe la hanesan baibain exceptu Ocecuse ne'ebe iha ona predisaun sei iha Kodisaun rai maran ne'ebe aumenta .
- Fall Army Worm (FAW): Iha reportasaun ne'ebe fo sai husi FAW iha Liquica no Baucau. FAW ne'ebe hatene hanesan altamente migratoriu, no desenvolve iha kondisaun diak no bokon. Maibe, laiha informasaun konkretu husi kausa ne, fahe husi FAW iha Timor-Leste. Hanesan Ministeriu Agricultura no Fisiariu (MAF) planu ona sei halao asesementu ne'ebe rapidu liu husi halo seleksaun ne'ebe kuidado los ba munisipiu 6 atu hatene FAW nia situasaun no ninia potensial impaktu iha Timor-Leste.

Analize ida ne'e bazeia ba dadus sekundariu. Nune'e importante hodi halo observasaun liu hosi satellite no observa direitamente iha baze no data hanesan ne kolekta husi MAF, Departamentu Meterolojia no Geo-fisika (DNMG), FAO no parseiro relvante. Atu hatene liu tan informasaun konaba reportasaun foin lalais ne ninian no infomasaun em jeral konaba WFP bele vizita https://www.wfp.org/countries/timor-leste





Rainfall performance & SPI in the last 6 months Sept-Feb 2020

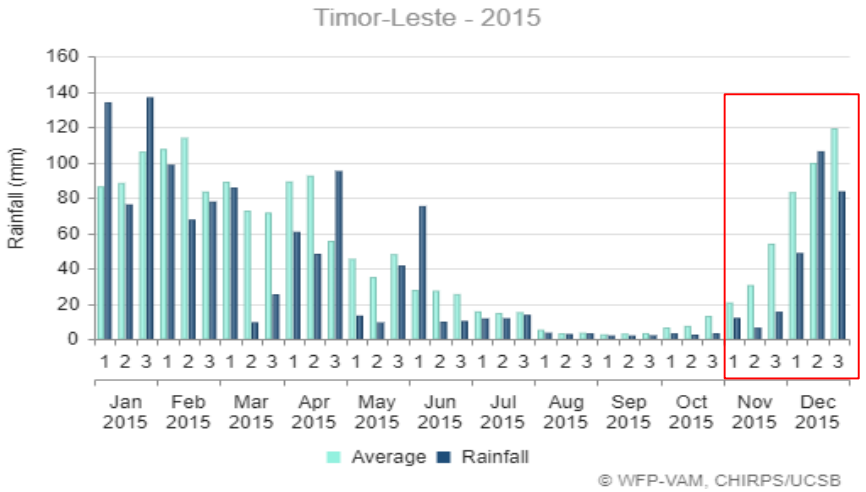


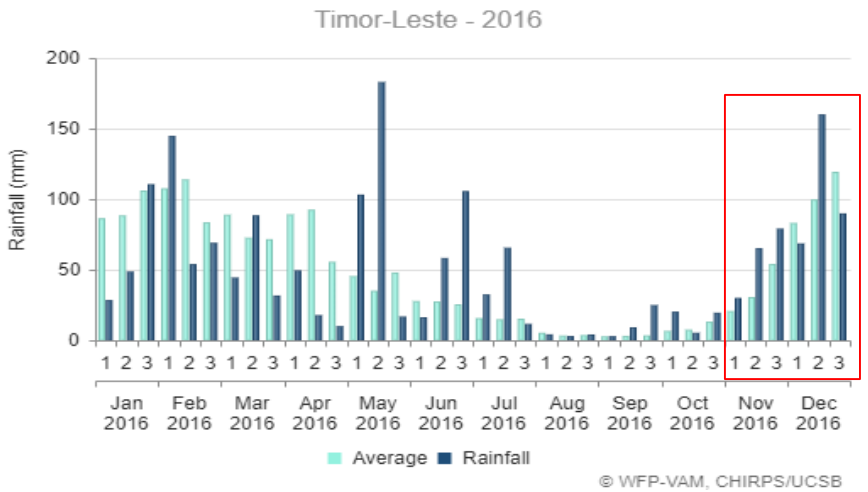
Compared to previous years, in the last 6 months (September 2019 to February 2020), Timor-Leste generally experienced less rainfall compared to the Long-Term Average (LTA) with the deviation ranging between 60-80% across the country except for Dili, Liquica, parts of Oecussi, Aileu, Baucau and Lautém. However, there has clearly been an influence of the rainy season as seen in the graphs, as more rainfall was received, the deviations from LTA became less.

The SPI of longer timescales (6 months; September 2019 - February 2020) is related to groundwater and reservoir storage. Lower performance of rainfall over the past 6 months as shown from above may have reflected into SPI. Over the long-time scale; the last six months, most parts of the country are shown to have been extremely dry with the most affected areas being Oecussi, the North and Eastern parts of the country as depicted in red on the lower map.

Data: CHIRPS, CHG UCSB

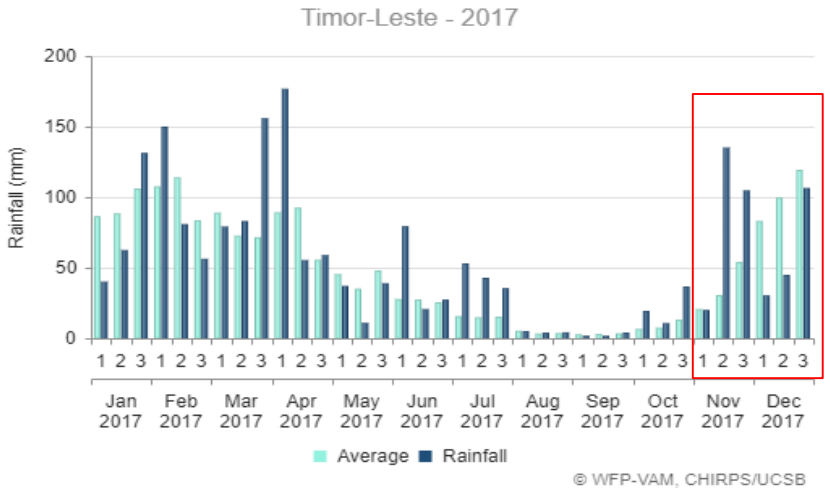
Rainfall performance of the preceding years (2015-2018)

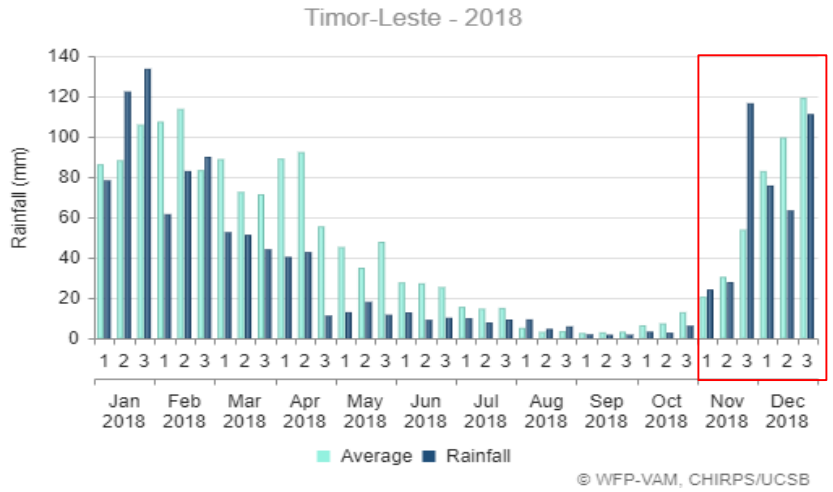


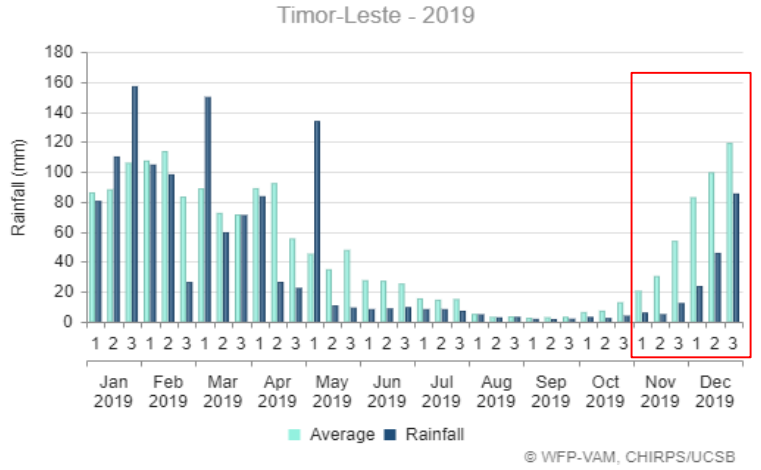


As depicted in the graphs on the left hand side, the rainy season in preceding years (2015-2018) is observed to have started in November. However, in 2019, the rainy season is seen to have been more pronounced in December (see graph below).

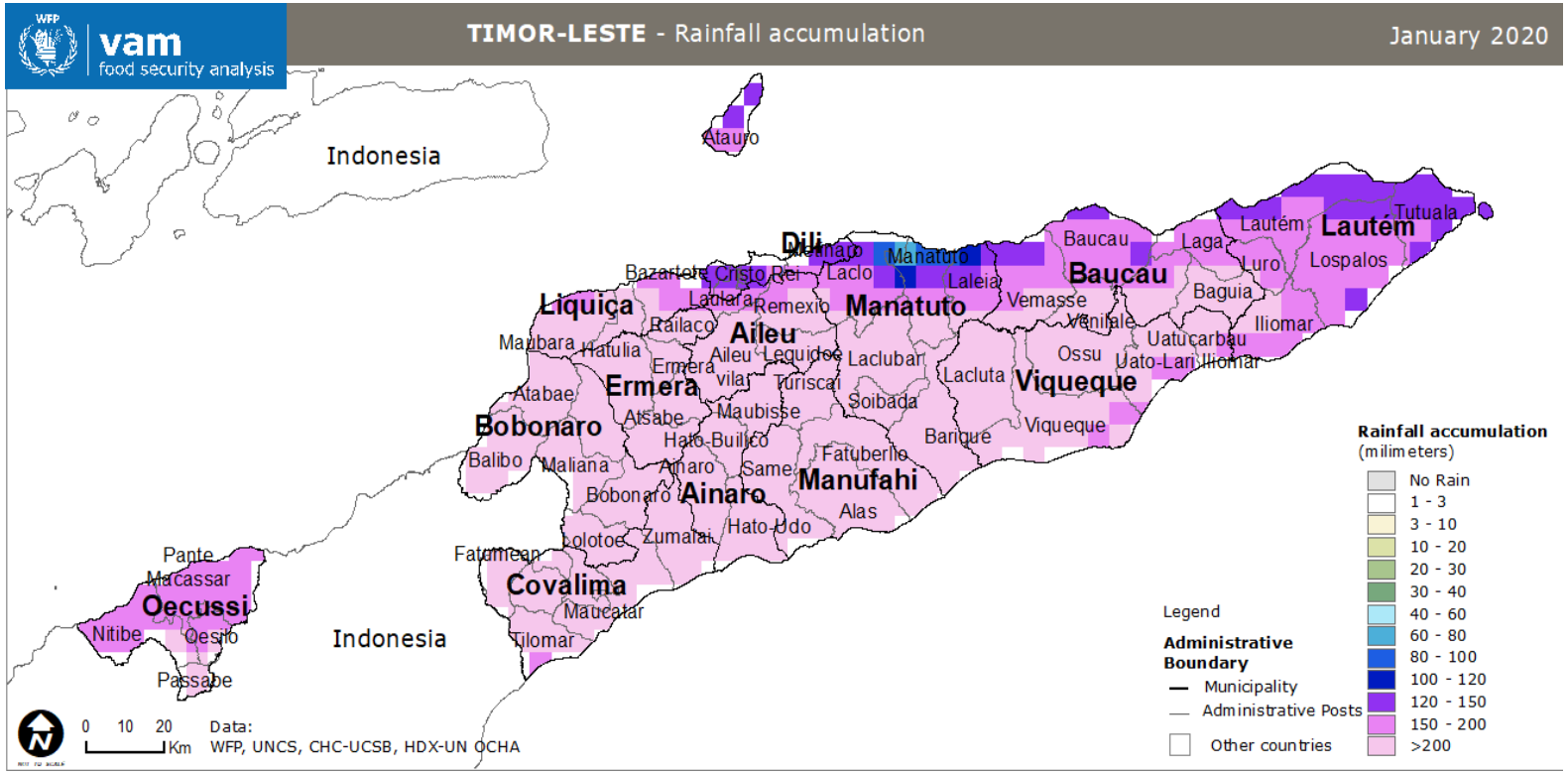
As such, planting seasons could have been delayed in places where farmers usually plant in November. However, this needs to be ascertained with ground observations.





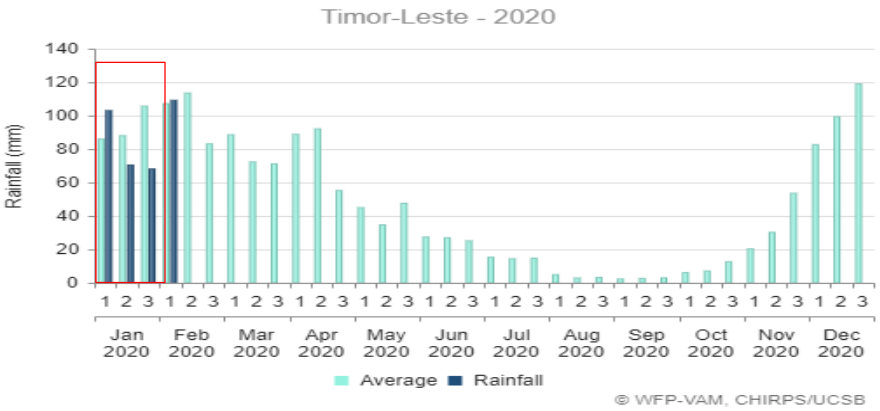


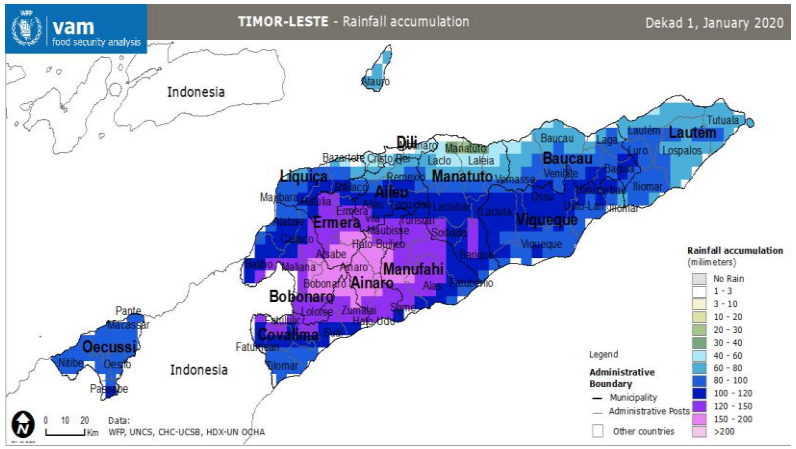
Rainfall Accumulation, January 2020

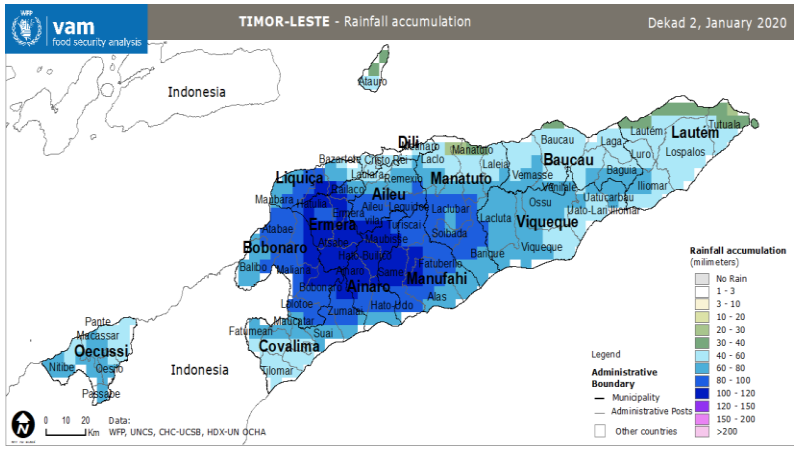


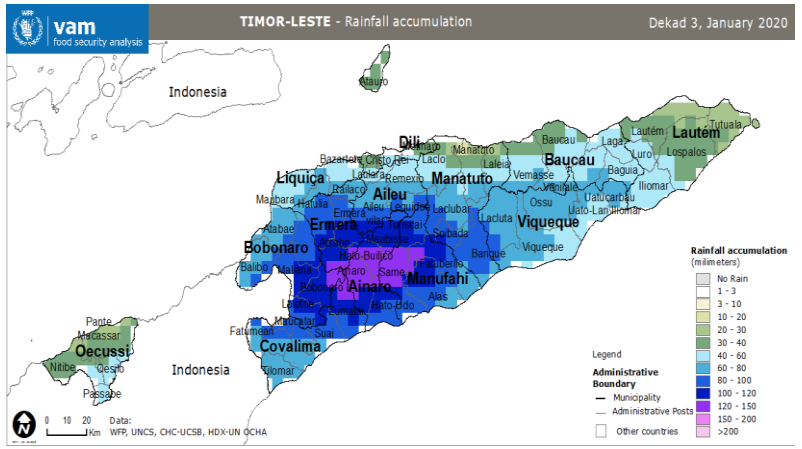
Despite receiving below average rainfall at the beginning of the wet season (throughout December 2019), Timor-Leste is shown to have generally received much more rainfall in January 2020. As depicted in the map on the left, most of the country is shown to have received rainfall above 200mm although there were exceptions notable in parts of Manatuto, Lautém and Dili (see map on the left above).

The first dekad of January registered much more rainfall than the second and third dekad with highland areas in Ainaro, Bobonaro, Ermera and Manufahi receiving the most rainfall (see smaller maps below).

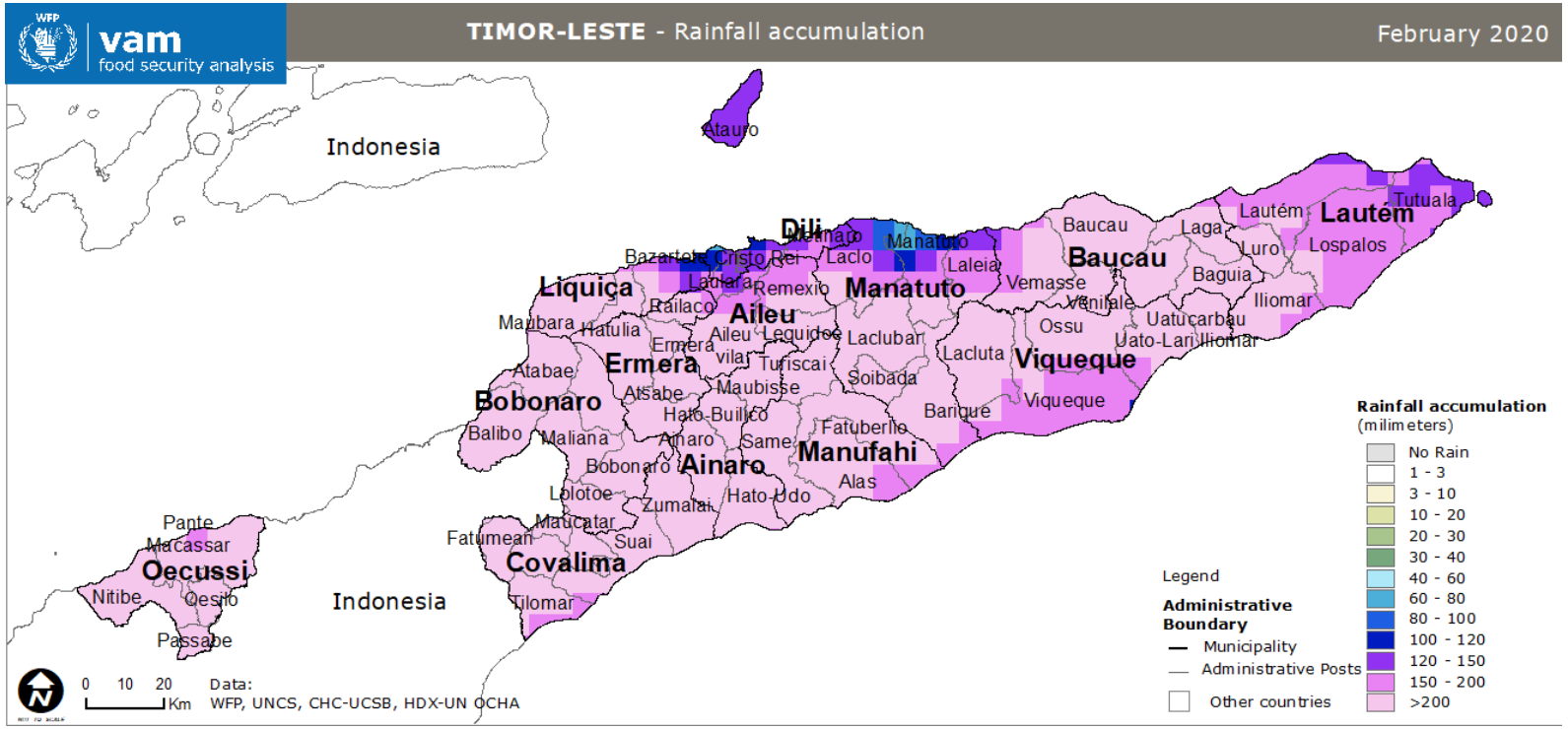






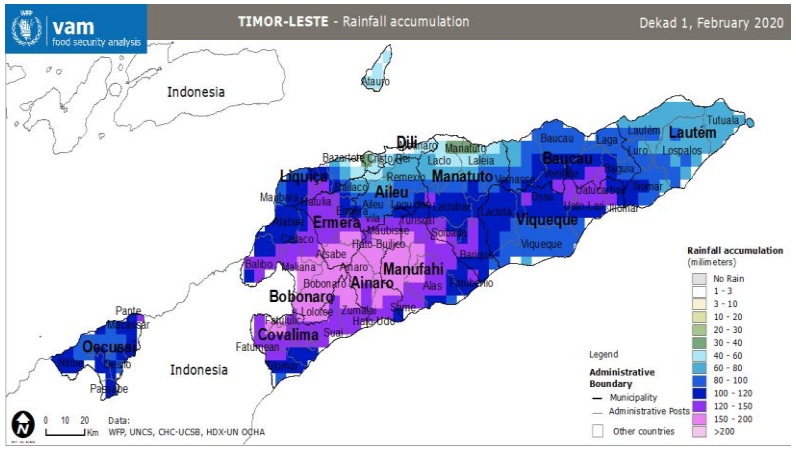


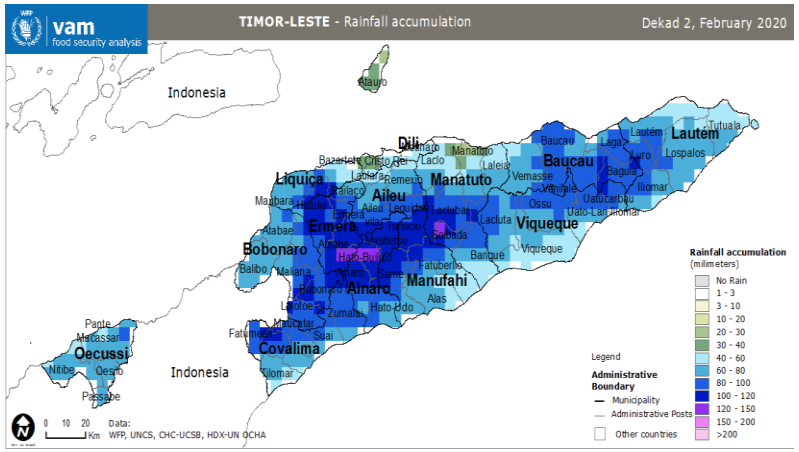
Rainfall Accumulation, February 2020

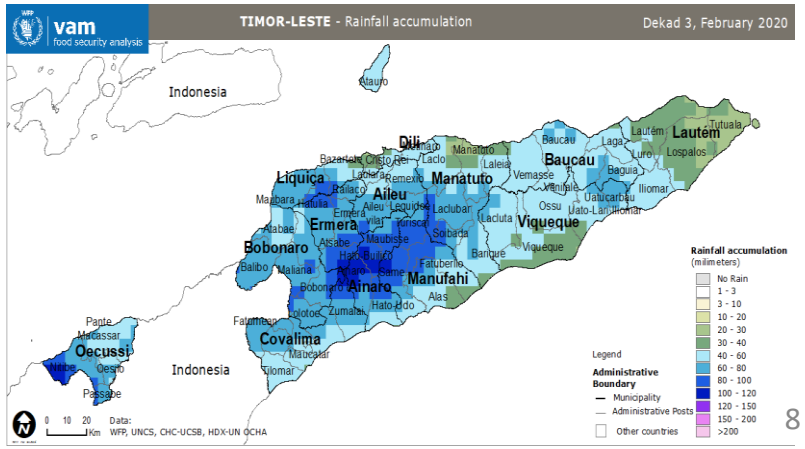


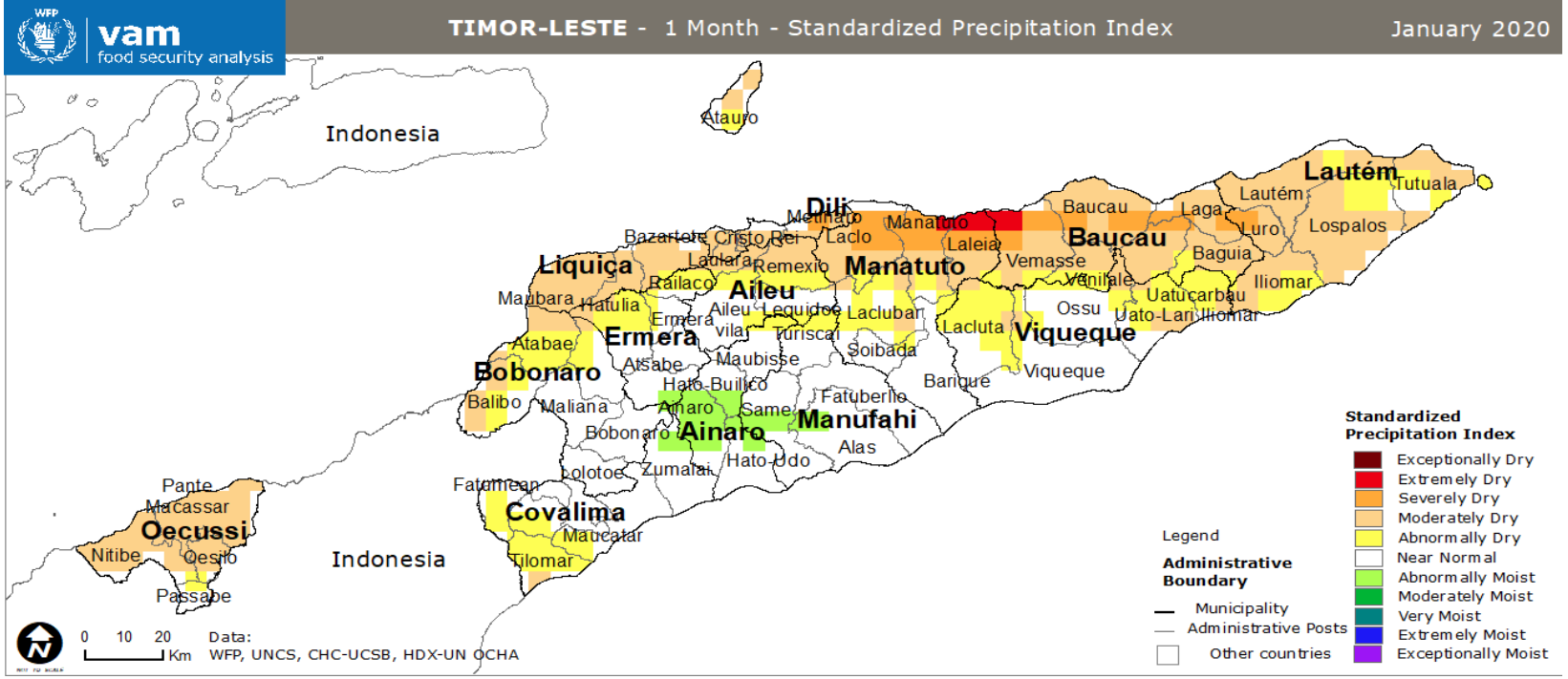
In February 2020, most of the country is still shown to have experienced heavy rainfall except over Dili, parts of Liquica, Manatuto, Lautém and Viqueque (see map on the left above).

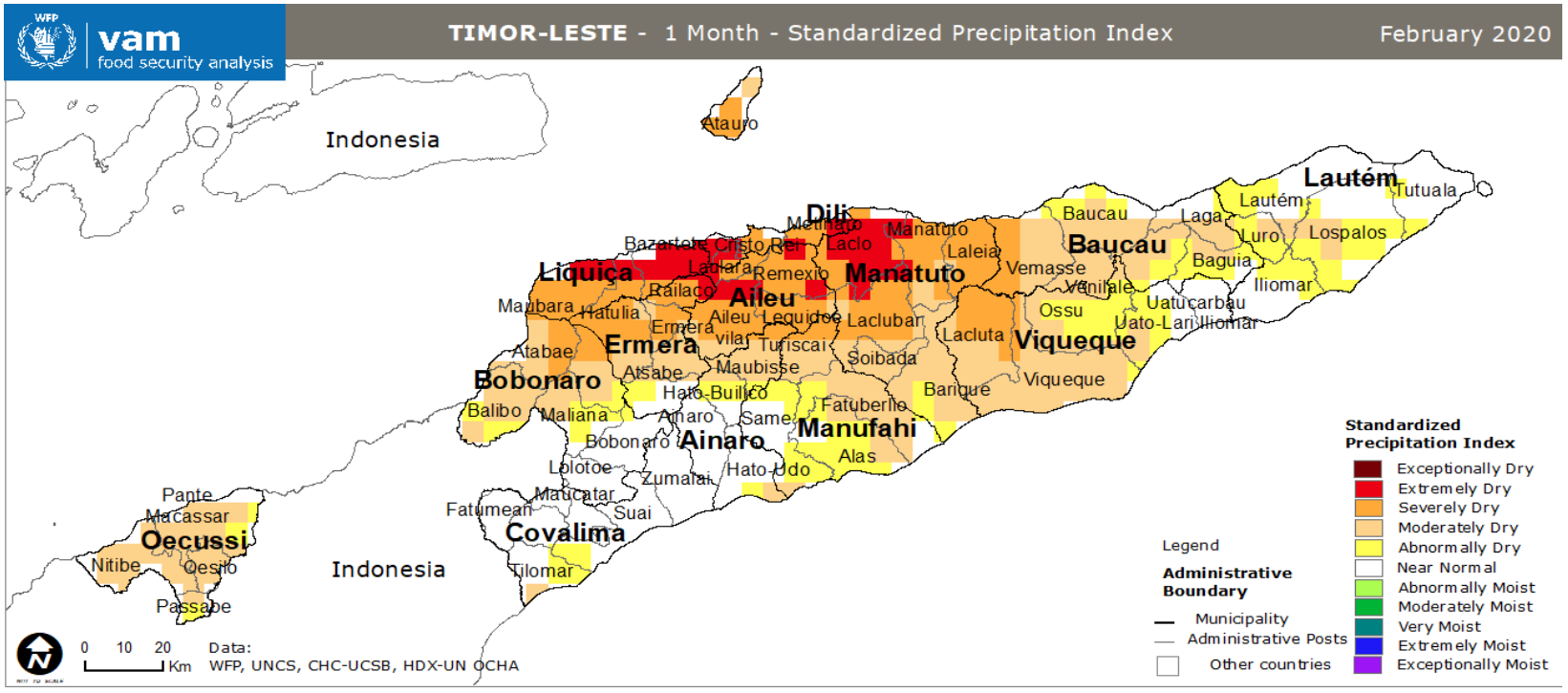
In the first dekad of February, most of the country is depicted to have received over 80mm of rainfall. However, other places like Dili Municipality, Manatuto in Manatuto Municipality and Bazartete in Liquica experienced relatively lower rainfall. Lautém similarly experienced lower rainfall amounts compared to the rest of the country. The second and third dekad of February 2020 registered lower rainfall compared to that of the first dekad with a concentration mostly around highland areas of Ainaro, Ermera and Manufahi (see smaller maps below).











1 month Standardized Precipitation Index (January & February 2020)

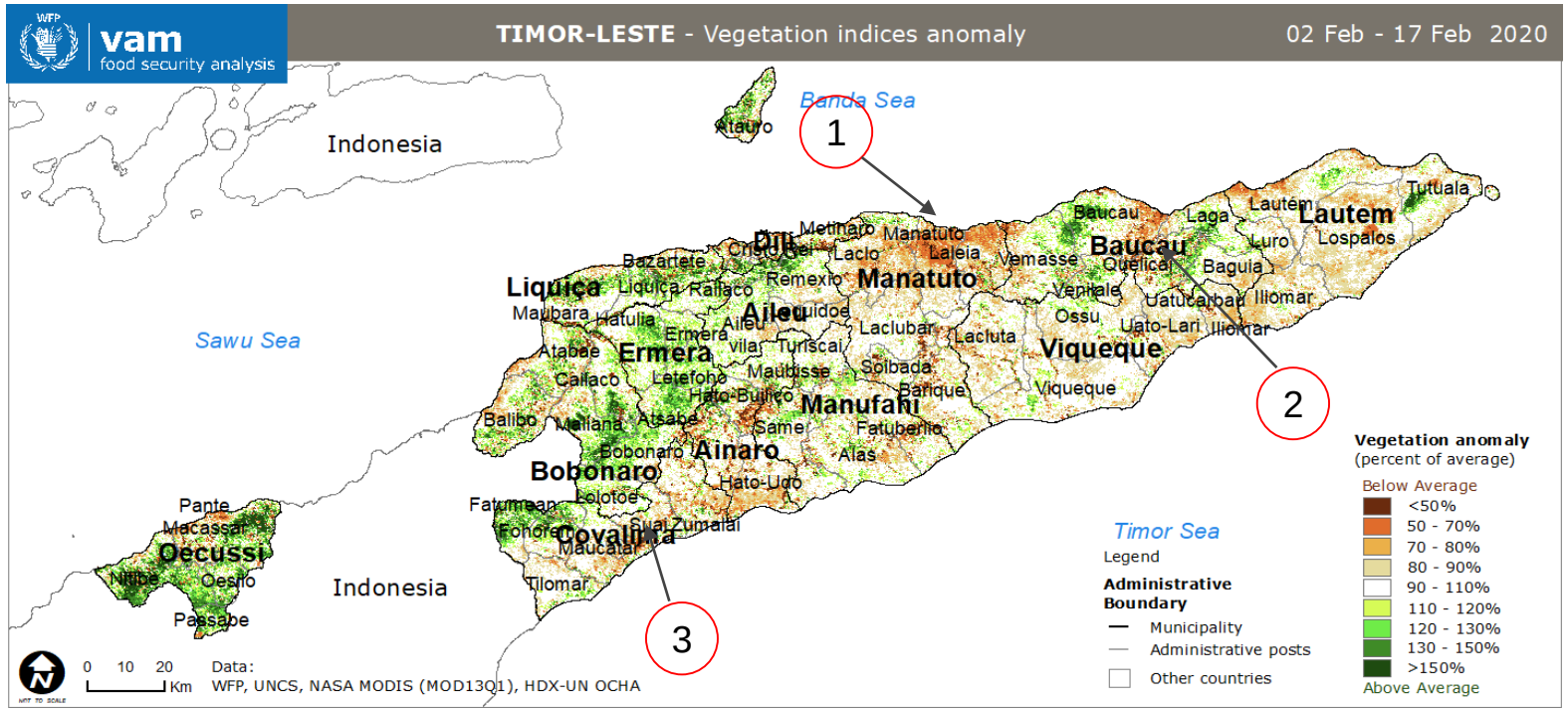
On short timescales, the standardized precipitation index (SPI) generally indicates soil moisture. In January 2020, the southern part of the country majorly experienced near normal conditions (no drought). However, a few places such as Nitibe in Oecussi, Laleia in Manatuto and Lautém & Lospalos in Lautém Municipality were seen to be moderately dry. Other areas like Tilomar in Covalima, parts of Aileu, Atabae and Baliba in Bobonaro, Laclubar in Manatuto, Lacluta & Uato-Lari in Viqueque and Tutuala in Lautém Municipality are shown to have been abnormally dry. Contrastingly, parts of Ainaro are shown to have been abnormally moist (See map on the left above).

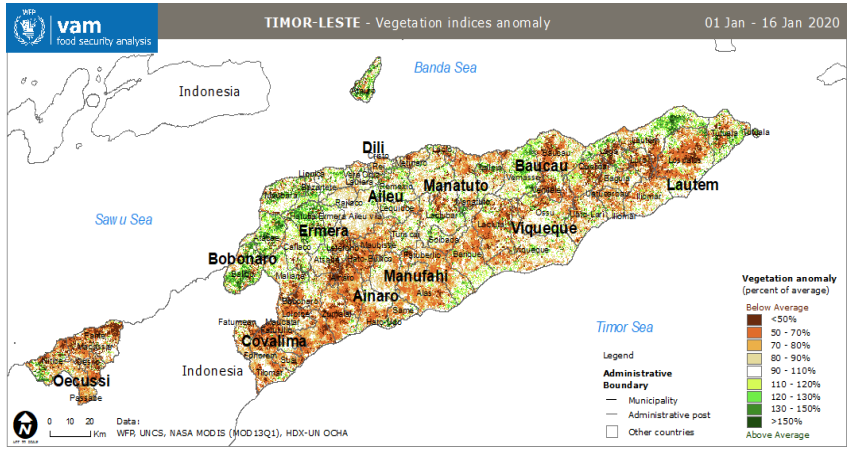
In February 2020, Iliomar and Tutuala in Lautém, Laga in Baucau, Uatucarbau in Viqueque, Covalima and Ainaro experienced near normal conditions (no drought) while Dili, Liquica, parts of Aileu and Manatuto are shown to have been extremely dry.

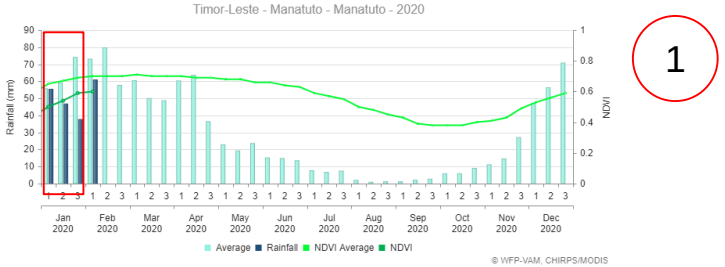
Dry conditions are seen to have exacerbated further south affecting areas that were relatively wetter in January 2020. The areas affected by the shift are shown to have experienced abnormally dry and moderately dry conditions. (See map on the left below).

Data: CHIRPS, CHG UCSB

Vegetation status, 02 - 17 February 2020







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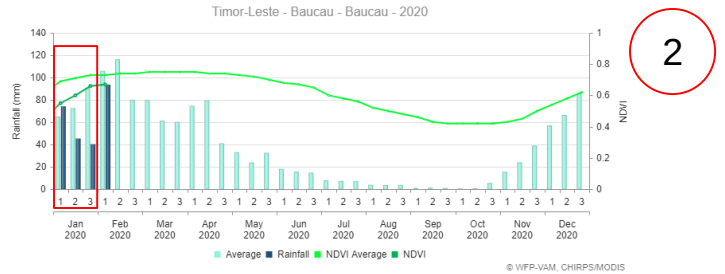

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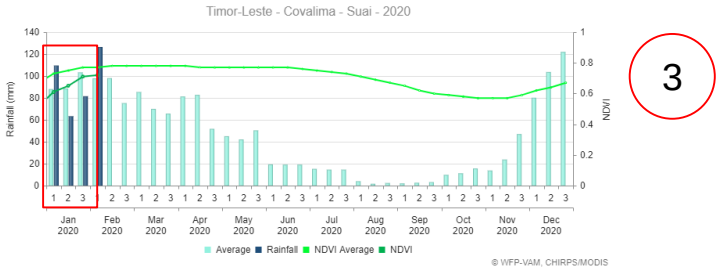
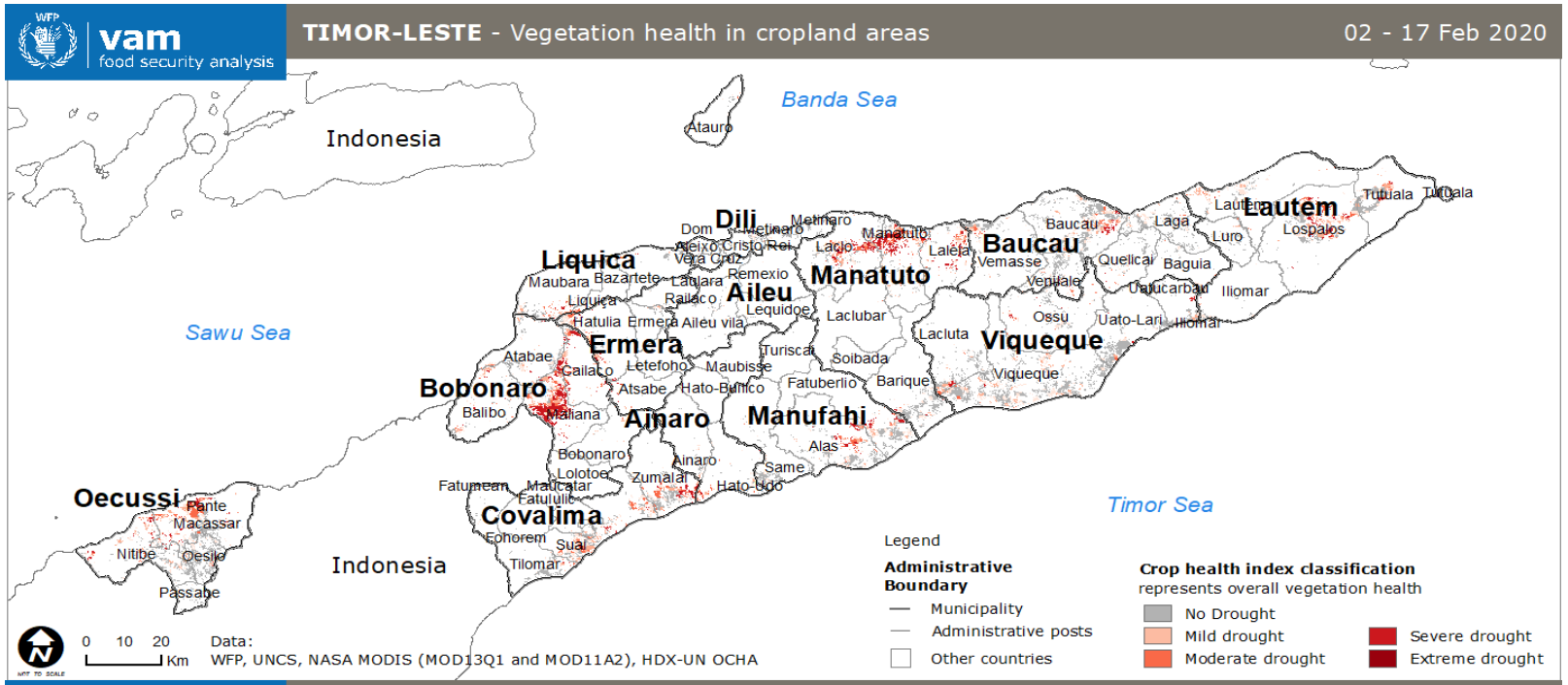


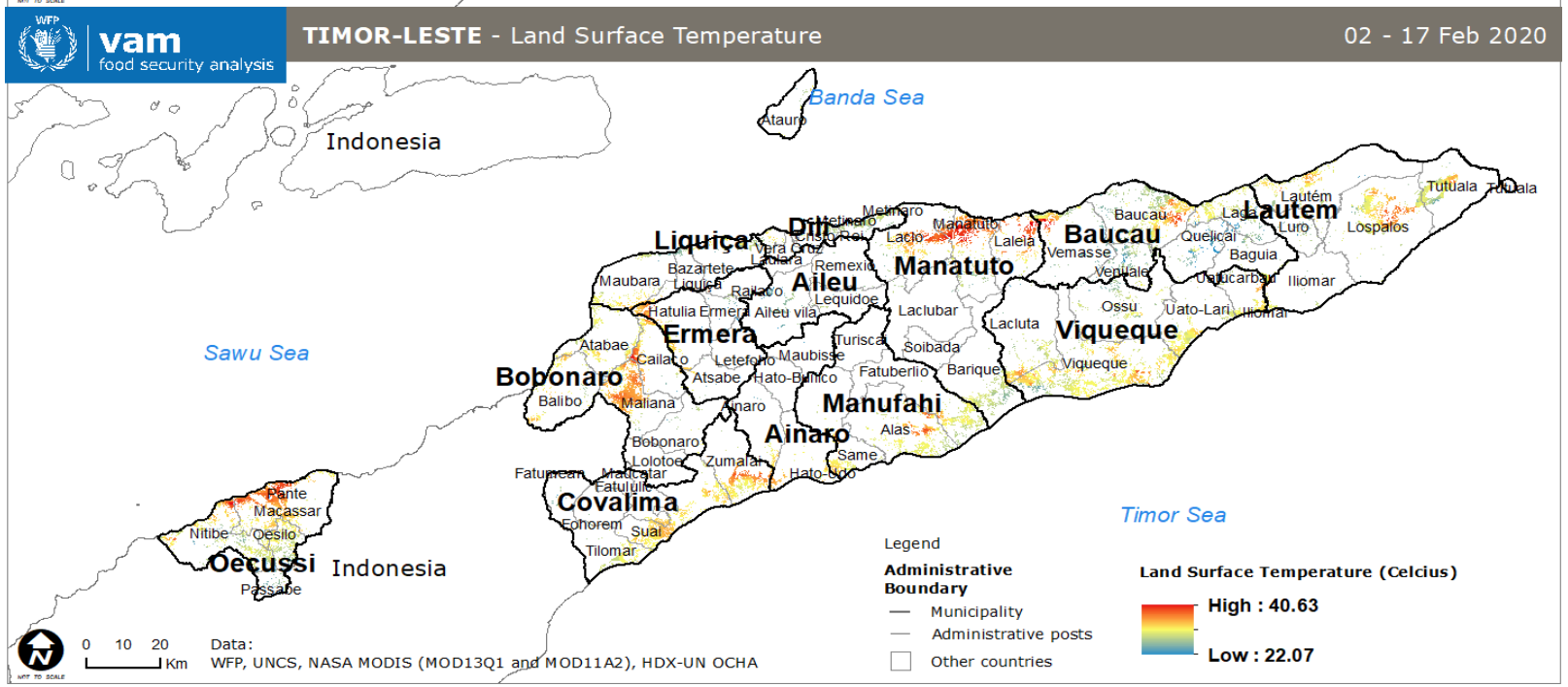
3

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

- **Dark blue: current rainfall season**
- **Light blue: long term average (LTA) rainfall**

Corresponding to the rainy season, rainfall throughout the country is reflected in vegetation status as seen in the bigger map above. A positive deviation in the vegetation indices is observed to correspond to rainfall accumulation in the season unlike in the smaller map on the left below; where the anomaly was more negative at the beginning of the wet season when there was less rainfall. Generally, anomalies are shown to be very small and in some areas positive; although negative anomalies are detected in some areas like Manatuto, Baucau and Suai. While this phenomenon could be attributed to other factors beyond the scope of this analysis, there was generally lower rainfall observed in these locations.





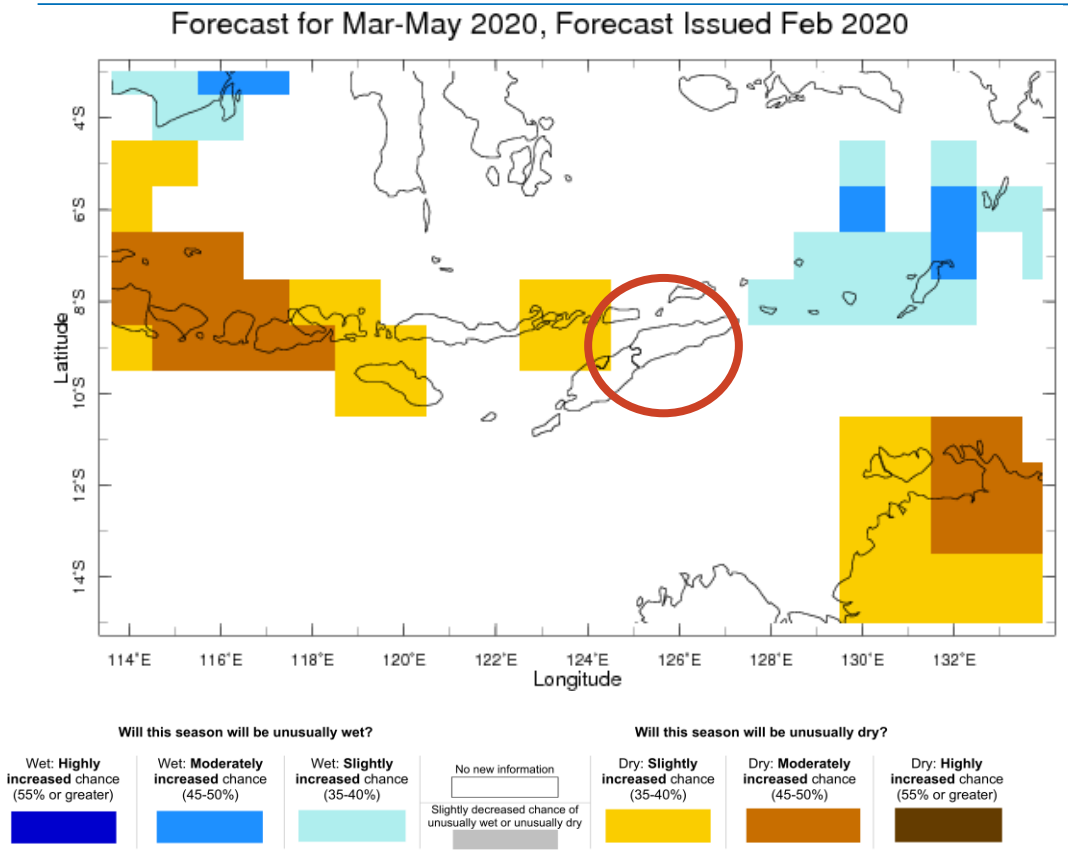
Vegetation Health in Cropland Areas 02 - 17 February 2020

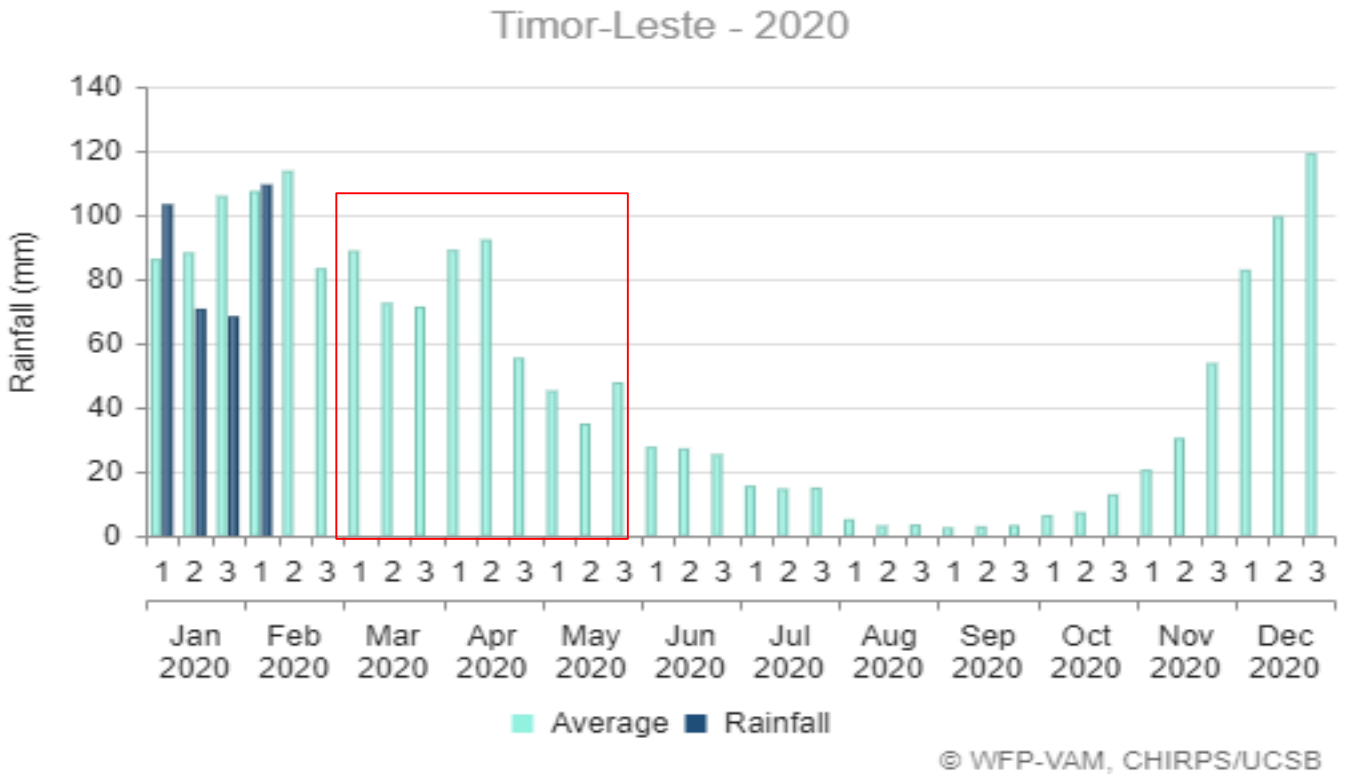
The Vegetation Health Index (VHI) combines two components: deviations in land surface temperature and the extent to which vegetation density varies from normal patterns. The VHI depicts stress on vegetation and can be used to assess potential crop losses.

Further to the impact of the rainfall on croplands, temperature plays a very critical role especially at the early growth stage of most crops. However, very high temperatures may have a negative impact. As seen in the maps on the left, the areas shown to suffer from severe drought are similarly depicted to have experienced very high temperatures in the reference period; as compared to croplands in other areas across the country. In Bobonaro, Manatuto, Covalima, Oecussi and Baucau, all the affected areas have exactly the same pattern of temperature and Vegetation Health Index. This illustrates a very interesting phenomenon, which attempts to elaborate that the health of croplands does not entirely depend on rainfall as commonly assumed. Further analysis of the actual crop primary productivity (Gross and Net Primary Productivity) and its response to temperature is currently 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.

Data: NASA MODIS

Rainfall outlook for March - May 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

IRI predicts that there will not be any unusually wet or dry conditions over Timor-Leste between March and May 2020. As seen in the graph on the right above, light blue bars indicate the rainfall Long Term Average (LTA). Amounts for each dekad are seen to range between 30-90mm.

However, these forecasts show only the likelihood of 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.

In 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 to 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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