

# Heavy rains and flooding in August affect primary rice producing areas in the Democratic People's Republic of Korea

Updated September 9<sup>th</sup>

## Highlights

- The April to September main cropping season in the Democratic People's Republic of Korea (DPRK) has been one of the wettest rainfall periods since 1981 across the southern agricultural producing provinces in the country (Figure 1,2). The majority of this rainfall was received in August (Figure 3), causing widespread flooding and inundating main season crops ready for harvest starting in September.
- The main producing southern provinces have been the hardest hit from the record rainfall in August (Figure 3), causing flooding across parts of North Hwanghae Province, South Hwanghae Province, South Pyongan, North Pyongan, and Kangwon Province.
- In early August, heavy rainfall from Typhoon 4 followed by additional rainfall through the first two weeks of the month resulted in landslides and flooding across the South, damaging 39,296 hectares of farmland, particularly in the North Hwanghae and Kangwon.
- On August 27<sup>th</sup>, Typhoon Bavi made landfall over the coast of North Pyongan province, bringing further heavy rains and winds to the key rice-producing provinces of North Hwanghae and South Hwanghae and damaging standing crops.
- This was followed by additional rains and damage to eastern coastal areas from Typhoons Maysak and Haishen at the start of September.
- Rainfall totals this season have been higher in some areas than the record 2007 season when DPRK experienced widespread flooding over the main producing southwest provinces that make up the country's "Cereal Bowl" with severe food security outcomes.
- Forecasts indicate above-average rainfall is expected to continue through September which could increase the risk of further flood events during a time when harvests should be underway for main season crops.

CHIRPS Season Rainfall Rank  
Period: 01Apr2020 - 31Aug2020

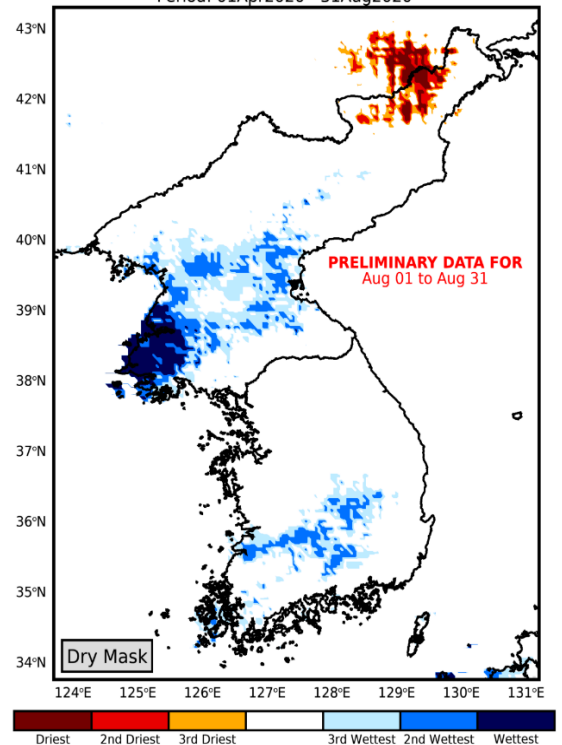


Figure 1. CHIRPS Rank graphic indicating seasonal rainfall totals for the April 1<sup>st</sup> to August 31<sup>st</sup> are ranked in the three wettest or three driest relative to the CHIRPS historical record (1981-2019). Source: UCSB Climate Hazards Center

CHIRPS Season Rainfall Anomaly (mm)  
Period: 01Apr2020 - 31Aug2020

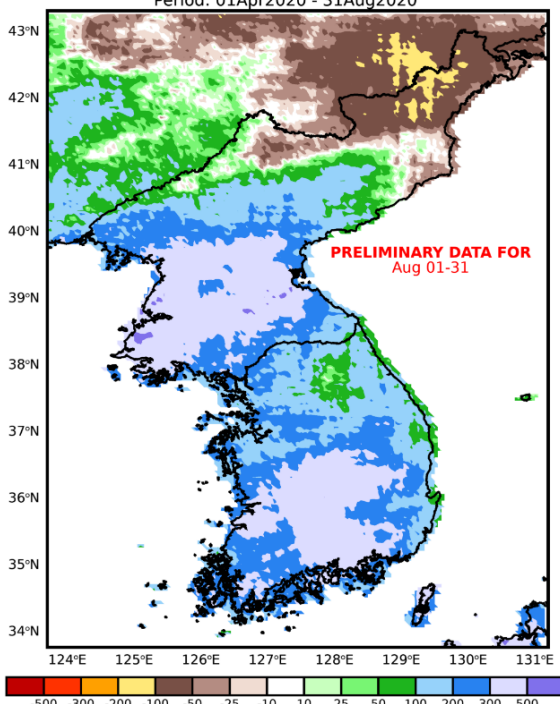


Figure 2. Seasonal Rainfall Anomaly for April 1<sup>st</sup> to August 31<sup>st</sup> over DPRK. Areas in light purple indicate where rainfall has been in the range of 300-500 mm above the average from 1981-2019. Source: UCSB Climate Hazards Center

## Overview

The April to September cropping period in southern DPRK has been the wettest on record since 1981 across South Hwanghae, and among the top three wettest seasons in North Hwanghae, South Pyongan, and parts of North Pyongan, South Hamgyong, and Kangwon provinces. The majority of this rainfall fell in August (Figure 2). From August 1<sup>st</sup> to 6<sup>th</sup>, Typhoon 4 brought torrential rain to North and South Hwanghae, North Pyongan, and Kangwon provinces as well as Kaesong City and other areas of the country<sup>1</sup> which was followed by additional rains throughout the first two weeks of August. Heavy rainfall resulted in flooding and landslides and damaged 39,296 hectares of farmland, particularly in North Hwanghae and Kangwon, as reported by the official Korea Central News Agency (KCNA).<sup>2</sup> This figure includes damage to 600 hectares of rice fields in North Hwanghae, an important rice-producing province, just weeks before the autumn rice harvest.<sup>3</sup>

The heavy rains caused infrastructure damage in some areas and broke a levee in North Hwanghae which flooded surrounding cropping areas.<sup>4</sup> Rainfall in early to mid-August was followed by Typhoon Bavi, the season's eighth typhoon and one of this year's most powerful storms,<sup>5</sup> which made landfall over the coast of North Pyongan province on August 27<sup>th</sup>. The storm brought further heavy rains as well as high winds to the South in North Hwanghae, South Hwanghae, and Pyongan, increasing concern for a reduced harvest

and potential food supply shortages.<sup>6</sup> However, DPRK leader Kim Jong-un reported the damage was smaller than expected after visiting an affected village, according to KCNA.<sup>7</sup>

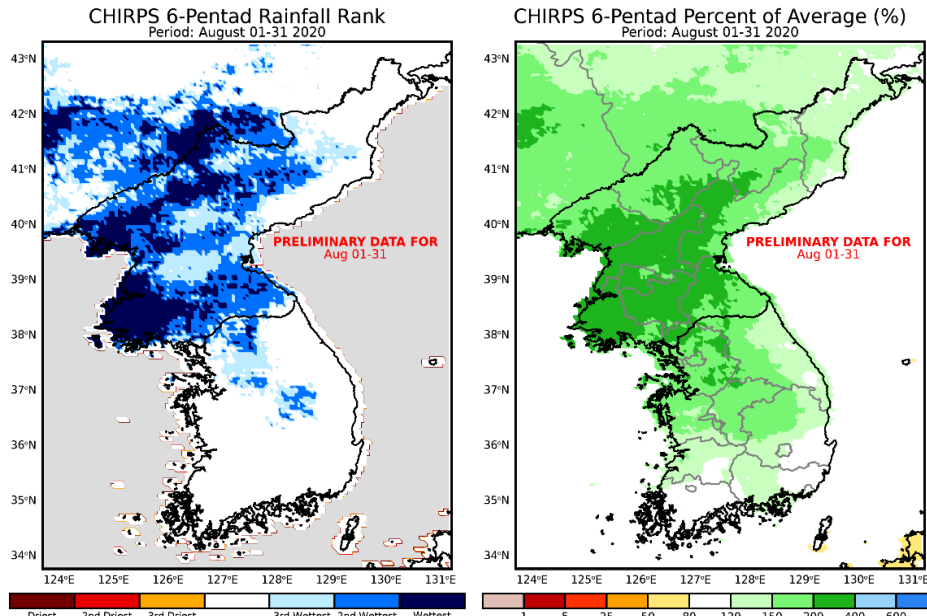


Figure 3. (left) CHIRPS Rank graphic indicating rainfall totals for the August 1<sup>st</sup> to August 31<sup>st</sup> ranked in the three wettest or three driest relative to the CHIRPS historical record (1981-2019). (right) Estimated percent-of-average rainfall anomaly from August 1<sup>st</sup> to 31<sup>st</sup> using the UCSB Climate Hazards Center Early Estimates to compare 2020 rainfall amounts to the 1981-2019 CHIRPS average. Source: UCSB Climate Hazards Center

Recent record rainfall and resulting flood damage come at the start of the main season harvest in DPRK, raising concerns for 2020 cereal production. Maize harvest was expected to start at the end of August across the main producing regions while rice harvest is expected to start at the end of September.<sup>8</sup> August flooding affected provinces in the agricultural heartland of the country known as the Cereal Bowl. In particular, South Hwanghae (Hwanghae-Namdo) is the largest rice and maize producing province in the country and was among the areas worst affected by flooding in August (Figure 3) along with North Hwanghae (Hwanghae-Bukto), South Pyongan (Pyongan-Namdo), and North Pyongan (Pyongan-Bukto), the second-highest cereal producing province, which together make up over half of the country's main producing areas.<sup>9</sup> Agro-climatological indicators for the 2020 main cropping season over these areas show cumulative seasonal rainfall to be above the five-year average with surface soil moisture at or slightly above the ten-year maximum (Figure 4).

### Agro-climatic Indicators for DPRK 2020 Main Cropping Season

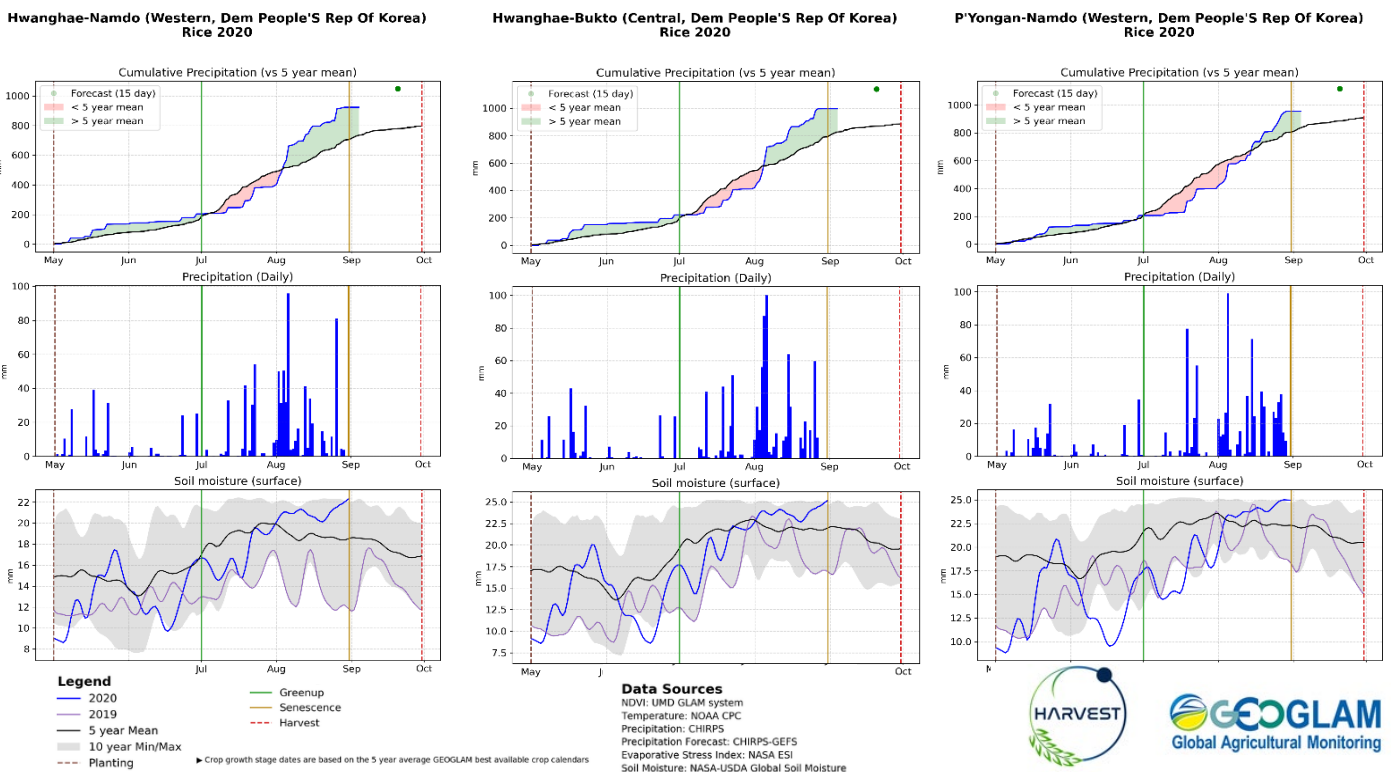


Figure 4. Agro-climatic indicators over the current 2020 main cropping season in Hwanghae-Namdo (South Hwanghae), Hwanghae-Bukto (North Hwanghae, and Pyongan-Namdo (South Pyongan). Source: NASA Harvest.

North Hwanghae province was among the areas hardest hit by flooding in early August, some of which occurred over agricultural lands and is visible from satellite imagery (Figure 5). While reported flood damages have been relatively limited, flooding near harvest time could impact final yields.

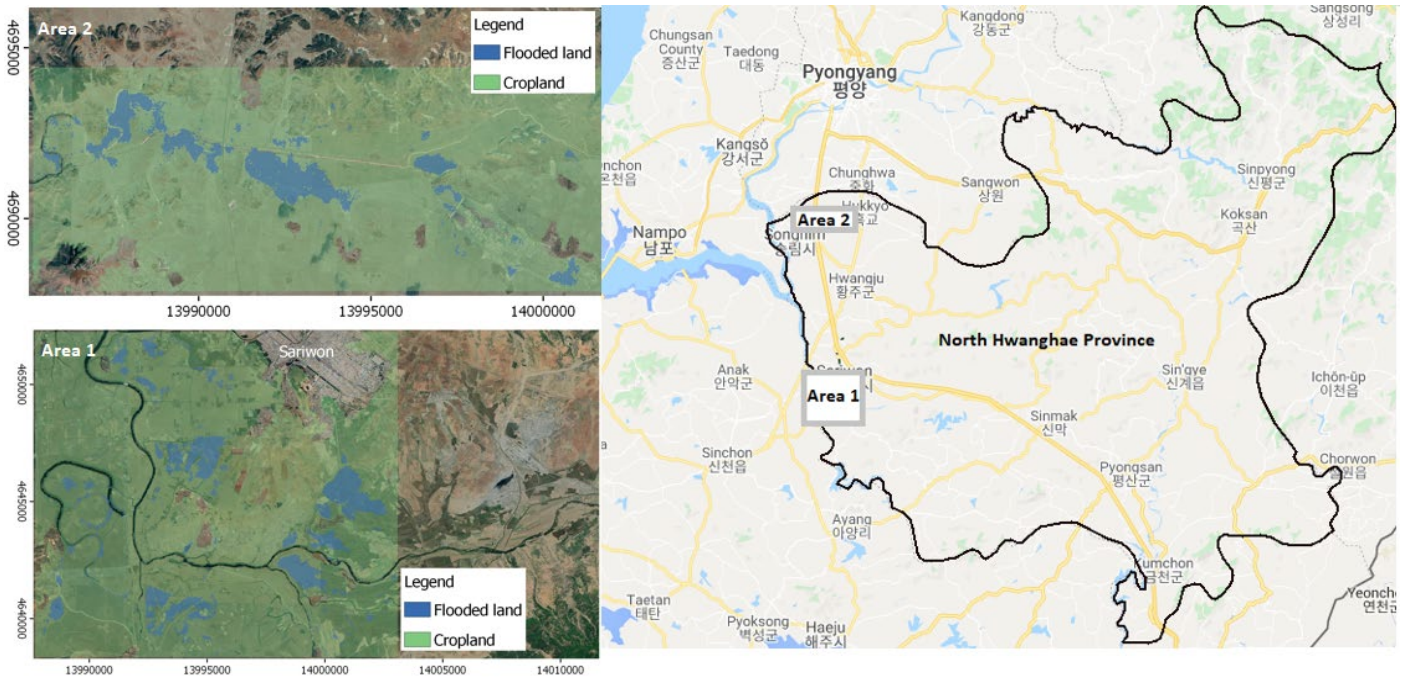


Figure 5. Flood water extent layer derived from Sentinel-1 images (date of flooding August 6<sup>th</sup>) and cropland layer (source of cropland layer: GLOBE LAND 30) overlaid to a Google Satellite background layer for two areas of interest in North Hwanghae highlighted by grey rectangles in the reference map (right- source: Google maps). Area 1: Located close to Sariwon town, flooded cropland: 985 ha. Area 2: Located west of Hukkyo, flooded cropland: 423 ha. Source: JRC ASAP

### September Rainfall Outlook

Two additional typhoons made their way towards the Korean Peninsula in the first week of September, bringing further rains and increasing the risk of additional flood damage. Typhoon Maysak made landfall on the southern Korean Peninsula on September 2<sup>nd</sup> as a Category 2 storm<sup>10</sup> and brought strong winds and flooding to eastern parts of DPRK on the 3<sup>rd</sup>, particularly in the eastern coastal city of Wonsan in Kangwŏn Province<sup>11</sup> and coastal areas of South and North Hamgyong provinces where KCNA reported the storm destroyed more than 1,000 houses and inundated public buildings and farmland.<sup>12</sup>

Following Typhoon Maysak, Typhoon Haishen was downgraded from a Category 2 storm to a tropical storm on September 7<sup>th</sup> as it moved towards southeastern DPRK after battering southern Japan and southwestern South Korea. The storm passed near the southwestern coast of DPRK and made landfall in the northeastern port Chongjin. Damaging winds and rainfall from back to back storms following an already record wet season could result in further flood damage.<sup>13</sup>

Short term forecasts through September (Figure 6-right) indicate above-average rainfall is expected to continue across much of the country, with the heaviest rainfall expected across the southern and northeastern provinces. Figure 6 indicates how the September forecasted rainfall could contribute to seasonal rainfall anomalies (Figure 5-left) and seasonal rainfall rank (Figure 5-middle).

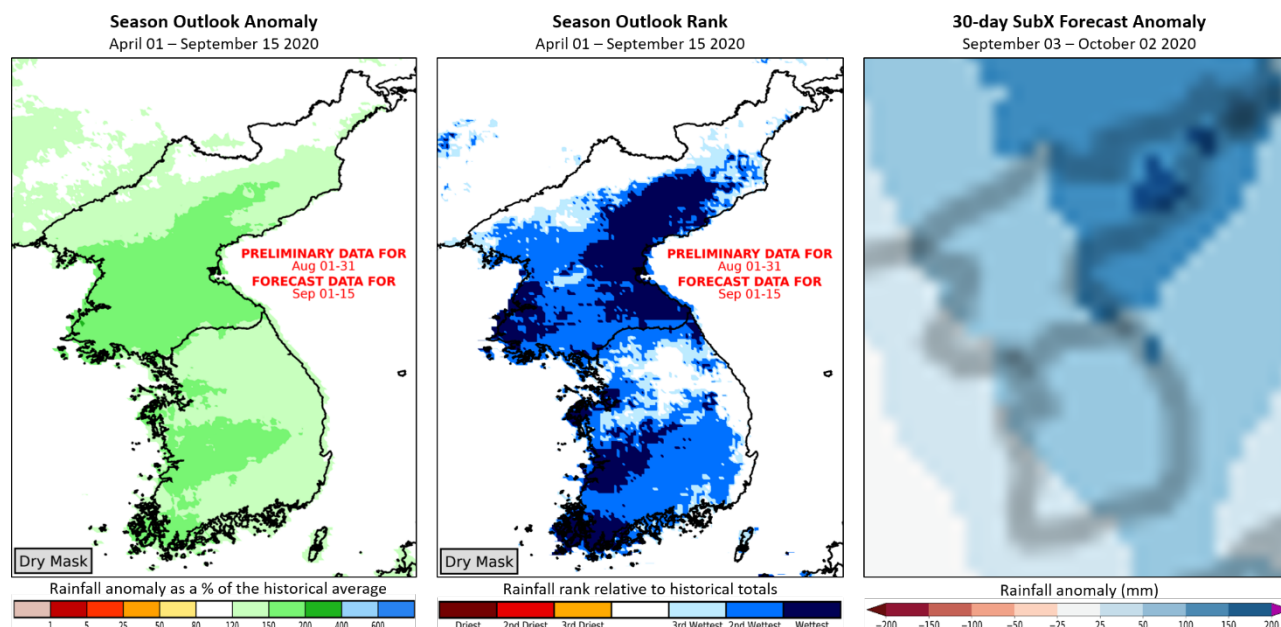


Figure 6. Estimated and forecast rainfall percent-of-average anomaly for April 1<sup>st</sup> to September 15<sup>th</sup>, estimated and forecast rainfall rank for April 1<sup>st</sup> to September 15<sup>th</sup>, and a 30-day rainfall anomaly forecast. The left and middle panels are UCSB Climate Hazards Center Early Estimates. They combine estimated rainfall since April 1<sup>st</sup> with the 15-day unbiased GEFs forecast from August 1<sup>st</sup>, and compare it to the 1981-2019 CHIRPS totals for the same period. The left panel shows the estimated percent-of-average anomaly. The middle panel indicates where the estimated rainfall total for April 1<sup>st</sup> to September 15<sup>th</sup> 2020 would rank in the three wettest or three driest relative to the CHIRPS historical record (1981-2019). The right panel is a 30-day forecast from September 3<sup>rd</sup>. The image shows the average of five Subseasonal Experiment (SubX) model forecasts from that day. The anomaly is based on the 1999 to 2016 model average. Skill assessments of SubX can be accessed [here](#). Source: UCSB Climate Hazards Center.

## Potential food security outcomes and response

The southern and western provinces are the breadbasket of DPRK and suffer chronic food shortages even during average rainfall years<sup>14</sup>. This year's rains follow two back to back poor seasons as the 2018 aggregate food production resulted in the lowest level since 2008 due to prolonged dry spells, high temperatures, flooding, and limited access to agricultural inputs, and the 2019 season experienced one of the worst droughts in decades as the country received only 42 percent of average rainfall in spring 2019.<sup>15</sup>

In some areas, the rains this season have surpassed the record 2007 rainfall levels when widespread flooding caused severe damage to 223,381 hectares of cultivated land in the main agricultural sector in the southwest "Cereal Bowl" provinces, reducing food availability and cereal transfers from food-surplus to food-deficit regions.<sup>16</sup> While reported damage this year has been significantly less than the 2007 flooding, the above-average rainfall forecasted for September and the passing of two more Typhoons across the region in the first week of September could result in further flood damage at a time when main season harvest should be underway, raising some concerns for 2020 cereal production.

Widespread flooding comes at a time with DPRK already facing the threat of COVID-19. In July, the country locked down an area around the city of Kaesong in response to a defector from South Korea who tested positive. However, the lockdown was recently lifted, and DPRK now reports no confirmed cases.<sup>17</sup> Despite flood damage, the country continues to take drastic action against the coronavirus, keeping its borders closed even to China, its main trading partner, and rejecting flood relief to prevent transmission. Instead, Kim Jong-un ordered the release of reserve grains for affected areas,<sup>18</sup> and 12,000 members of the ruling Workers' Party will be sent to South and North Hamgyong provinces to aid recovery.<sup>19</sup> The Food and Agriculture Organization of the United Nations (FAO) and World Food Programme (WFP) Joint Rapid Food Security Assessment indicated that 10.1 million North Koreans, 40 percent of the population, were estimated to be food insecure in 2019.<sup>20</sup> Considering the recent impacts of COVID-19 and extensive flood damage, this estimate is likely to have increased in 2020, posing additional concerns to the state of food insecurity in the country.

The GEOGLAM Crop Monitor team is monitoring the situation. Further information and updates will be provided in the next Crop Monitor for Early Warning, to be released October 8<sup>th</sup>.

## Endnotes

- <sup>1</sup> "Democratic People's Republic of Korea: Torrential Rain with High Wind - Information Bulletin." Reliefweb. August 20, 2020. <https://reliefweb.int/report/democratic-peoples-republic-korea/democratic-people-s-republic-korea-torrential-rain-high-0>.
- <sup>2</sup> "North Korea – Over 16,000 Homes Damaged or Destroyed in Floods." Floodlist. August 15, 2020. <http://floodlist.com/asia/north-korea-floods-august-2020>.
- <sup>3</sup> Gallo, William. "Hit by Historic Monsoon, N. Korea Warns of More Floods." Reliefweb. August 11, 2020. <https://reliefweb.int/report/democratic-peoples-republic-korea/hit-historic-monsoon-n-korea-warns-more-floods>., "Kim Jong-un Warns over North Korea Typhoon and Coronavirus." BBC News. August 26, 2020. <https://www.bbc.com/news/world-asia-53915606>., "DPRK Food Grains Situation Update in MY 2018-19." United States Department of Agriculture (USDA) FSA. January 21, 2020. [https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=DPRK Food Grains Situation Update in MY 2018-19\\_Seoul\\_Korea - Republic of\\_01-14-2020](https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=DPRK%20Food%20Grains%20Situation%20Update%20in%20MY%202018-19_Seoul_Korea%20-%20Republic%20of_01-14-2020).
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- <sup>5</sup> "North Korea Puts All-out Efforts to Minimize Crop Damage from Typhoon." Inquirer.net. August 31, 2020. <https://newsinfo.inquirer.net/1329336/north-korea-puts-all-out-efforts-to-minimize-crop-damage-from-typhoon>.
- <sup>6</sup> "DPRK, Republic of Korea, China - Tropical Cyclone BAVI (GDACS, JTWC, JMA, CMA, KMA, Media) (ECHO Daily Flash of 27 August 2020)." Reliefweb. August 27, 2020. <https://reliefweb.int/report/democratic-peoples-republic-korea/dprk-republic-korea-china-tropical-cyclone-bavi-gdacs-jtwc>.
- <sup>7</sup> "North Korea Puts All-out Efforts to Minimize Crop Damage from Typhoon." Inquirer.net. August 31, 2020. <https://newsinfo.inquirer.net/1329336/north-korea-puts-all-out-efforts-to-minimize-crop-damage-from-typhoon>.
- <sup>8</sup> "Country Briefs: Democratic People's Republic of Korea." Food and Agriculture Organization of the United Nations (FAO). May 13, 2020. <http://www.fao.org/giews/countrybrief/country.jsp?code=PRK>.
- <sup>9</sup> "DPRK Food Grains Situation Update in MY 2018-19." United States Department of Agriculture (USDA) FSA. January 21, 2020. [https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=DPRK Food Grains Situation Update in MY 2018-19\\_Seoul\\_Korea - Republic of\\_01-14-2020](https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=DPRK%20Food%20Grains%20Situation%20Update%20in%20MY%202018-19_Seoul_Korea%20-%20Republic%20of_01-14-2020).
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- <sup>11</sup> "North Korea – Rain from Typhoon Maysak Triggers Flooding in Eastern Areas." Floodlist. September 3, 2020. <http://floodlist.com/asia/north-korea-typhoon-maysak-september-2020>.
- <sup>12</sup> Lapin, Tamar. "Kim Jong Un Fires Top Official While Touring Typhoon-stricken Areas." New York Post. September 6, 2020. <https://nypost.com/2020/09/06/kim-jong-un-fires-top-official-while-touring-typhoon-stricken-areas/>., "Seeking Unity, North Korea's Kim Vows to Overcome Typhoon Damage." Star Advertiser. September 6, 2020. <https://www.staradvertiser.com/2020/09/06/breaking-news/seeking-unity-north-koreas-kim-vows-to-overcome-typhoon-damage/>.
- <sup>13</sup> "Typhoon Hishen: four missing in Japan as storm pounds South Korea." The Guardian. September 7<sup>th</sup>, 2020. <https://www.theguardian.com/world/2020/sep/07/typhoon-haishen-millions-evacuated-as-japan-pm-calls-for-utmost-caution>.
- <sup>14</sup> Sang-Hun, Cho. "North Korea, Fighting to Hold Back Virus and Floods, Says No Thanks to Outside Aid." The New York Times. August 14, 2020. <https://www.nytimes.com/2020/08/14/world/asia/north-korea-floods-coronavirus.html>.
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- <sup>17</sup> Gallo, William. "22 Dead, 4 Missing in North Korea Floods." VOA News. August 14, 2020. <https://www.voanews.com/east-asia-pacific/22-dead-4-missing-north-korea-floods>.
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- <sup>20</sup> "Democratic People's Republic Of Korea (DPRK) May 2019 FAO/WFP Joint Rapid Food Security Assessment." World Food Programme (WFP)/Food and Agriculture Organization of the United Nations (FAO). May 2019. [https://docs.wfp.org/api/documents/WFP-0000104948/download/?\\_ga=2.240265091.1681057620.1599661240-443292462.1599661240](https://docs.wfp.org/api/documents/WFP-0000104948/download/?_ga=2.240265091.1681057620.1599661240-443292462.1599661240).

## Prepared in Collaboration with:



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*\*EC contribution is provided by the Joint Research Centre of the European Commission.*



Prepared by members of the GEOGLAM Community of Practice Coordinated by the University of Maryland with funding from NASA Harvest. The Crop Monitor is a part of GEOGLAM, a GEO global initiative.

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