United States Department of Agriculture

**Foreign Agricultural Service**
Global Market Analysis
International Production Assessment Division
Web: https://ipad.fas.usda.gov

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Commodity Intelligence Report

# North Korea MY 2024/25 Seasonal Crop Outlook and Excess Rainfall and Flood-Related Analysis

In North Korea, the marketing year (MY) 2024/25 summer crops have progressed well from May through July. The rainy season typically starts in April and about 80 percent of the annual precipitation, on average, occurs between July and September. This year's growing season began with beneficial soil moisture conditions, and the rainfall continued to be above average, providing favorable conditions for planting and crop establishment during May, June, and July. However, at the end of July, the conditions in North Pyongan (P'yongan-bukto) and some parts of South Pyongan (P'yongan-namdo) have raised concerns due to excess rainfall and the potential for flood damage risks. These northwest provinces received heavy rains that potentially resulted in flooded villages and agricultural farmlands (Figure 3, 4). According to Food and Agriculture Organization of the United Nations (FAO), North Pyongan province was impacted most by the heavy rains and severe flooding; it is the largest region for corn production and second largest for rice production in the nation. The official Korean Central News Agency reported that roughtly 4,000 homes were damaged or destroyed and 3,000 hectares (ha) of agricultural fields were flooded in Sinuiju and Uiju counties in North Pyongan province along the Chinese border.

USDA's analysis of flooding for North Korea uses a three-tier process, beginning with a rapid assessment at the geospatial level of 10 km (6 miles), followed by an assesment of flooding at 375 meters, and finishing with observations at the 10 meter level. An analysis of agricultural area affected using a geospatial tool within GADAS (Global Agricultural & Disaster Assessment System) provides a preliminary assessment of the area potentially impacted by excess rainfall and flooding. As of July 31, the assessment indicated approximately 227,000 hectares (ha) of general agricultural land was at potential flood damage risk, of which approximately 38,000 ha is rice farmland and 47,000 ha is corn farmland (Figure 5, 6). The GADAS tool uses the International Food Policy Research Institute's (IFPRI) land cover from 2010 with a spatial resolution of 10 km. Further assessment of the extent of the flood was done using Worldcover's 10 meter spatial resolution imagery and a 2021 crop mask at a subregional level in Pyongan-bukto, Pyongan-namdo, Chagang-do, and Sinuiju, revealing that approximately 69,046 ha of land was flooded in these four regions, of which 27,195 was flooded croplands (Figure 7a, 7b). In Pyongan-bukto, a total of 26,343 ha of land was flooded, 12,430 ha of cropland; in Pyongan-namdo a total of 18,834 ha of land was flooded, 8,685 ha of cropland; in Chagang-do a total of 22,609 ha of land was flooded, 5,150 ha of cropland; and in Sinuiju a total of 1,260 ha of land was flooded, 930 ha of cropland (Figure 7). This comprehensive

analysis was based on the use of a 375-meter spatial resolution NOAA/NESDIS VIIRS 5-day flood Composite data (July 30 to August 3) and the ESA Worldcover 10-m 2021 Crop Mask.

USDA is conducting additional analysis and evaluation of the situation focusing on "before", "during", and "after" the flooding event. The continued efforts will provide more comprehensive confirmation of where (locational) and how much (magnitude) agricultural croplands were flooded or submerged, for how long, and the degree of crop damage.

The flooding impact is important locally, however, as of the end of July, the rainfall and flooding impact assessment appears to show a minimal impact nationwide. As of the end of June, harvest was complete for winter and spring barley. Spring-summer grains, rice, corn, and soybeans are in mid-to-advanced grain-filling stages with harvest typically starting in early September (Figure 1). The main season (April to October) crops are rice and corn, accounting for almost 90 percent of the total crop output. Additionally, there are small quantities of soybeans, potatoes, millet, and sorghum. Rice is predominantly produced in the western provinces of South Hwanghae (28%, Hwanghae-namdo), North Pyongan (22%, P'yongan-bukto), South Pyongan (20%, P'yongan-namdo), and South Hamgyong (11%, Hamgyong-namdo). The southern, southwestern, and western provinces are considered the "cereal bowl regions" (Figure 2). In recent years, potatoes have emerged as a staple crop in addition to rice and corn, contributing about 8 percent to the annual output of food crops. Wheat and barley contribute approximately 2 percent to total annual food production; these are mainly winter crops with a small amount planted in early spring.

USDA forecasts a generally favorable, above-average crop outlook for MY 2024/25, particularly for rice and corn, with the overall production expected to remain similar to last season. The 2023 season experienced expansion in planted area, as indicated by USDA's most recent satellite-based crop classification product; presumably the planted area was maintained in the current 2024 season. However, in recent years, according to North Korea's Ministry of Agriculture, new land has been brought under production through such projects as river improvements, straightening of waterways, land reclamation, and relocation of public buildings.

**Rice:** At the end of July, despite the flooding in North Pyongan (P'yongan-bukto) and some parts of South Pyongan (P'yongan-namdo), most of the major cropping regions have not been subjected to potential excess rainfall and flood risks. Therefore, USDA forecasts MY 2024/25 North Korea rice production to be the same as last year's production at 2.26 million tons (rough basis) (Figure 18) and rough rice yield to remain at last year's level of 4.18 tons per hectare (t/ha). The current rice yield forecast is almost 12 percent below the 5-year average of 4.76 t/ha (Figure 17). The lower yields are primarily due to the expansion of rice planted area in marginal lands and poor capacity to import much-needed agricultural inputs, such as improved hybrid seeds and fertilizers. Input availability continues to be impacted by global economic sanctions. Rice planted area is up approximately 3 percent from the 5-year average.

**Corn:** USDA forecasts North Korea MY 2024/25 corn production at 2.3 million tons (Figure 20). The current corn crop outlook for North Korea indicates a forecast yield of 3.93 t/ha, which is almost the same as the long-term average expectation (Figure 19). The current crop forecasts incorporate the season's satellite-based observations of soil moisture conditions and crop growth based on the satellite-derived NDVI (Normalized Difference Vegetation Index), as well as the seasonal rainfall outlook, based on various agro-climatological sources. In June and most of July, the rainfall and soil moisture conditions were generally very favorable and predominantly above average across the major crop growing regions. The beneficial early-to-mid season growing conditions are projected to have encouraged further summer crop plantings and favorable crop establishment across most parts of North Korea's cropping region.The soil moisture conditions continued to be adequate into July during advanced vegetative and early reproductive crop stages, ensuring a good finish to the crop.

Weather conditions this season have been generally conducive for crop growth, with well distributed and adequate rainfall amounts recorded between April and July 2024. Reflecting these weather patterns, as of the end of July, remote sensing data indicated average to above-average vegetation conditions in the main crop producing areas**.** The NDVI time series graphs for the major corn and rice production provinces of Pyongan-bukto and Pyongan-namdo generally indicate favorable crop performance for 2024 relative to the long-term average (Figures 13). The provinces of Pyongan-bukto, Pyongan-namdo, Hwanghae-bukto, and Hwanghae-namdo account for roughly 80 percent of rice production. In addition, the NDVI images for June, July, and August also show that crop conditions have been above average during the most critical period of plant growth and development (Figure 10, 11, 12). In general, the crop performance before and immdiately after the excess rainfall and potential flooding can be characterized as favorable, likely to result in maintaining average-to-above-average production. In June, vegetation conditions were favorable, compared to the longterm expections (Figures 10); in early July, vegetation conditions continued to maintain similar outlook (Figures 11); and in early August vegetation conditions also continued to maintain a positive outlook (Figure 12). GDA Corp's GeoChronicals imagery provided further convergence of evidence of localized physical indicators at selected locations (Figure 13, 14, 15). In North Korea, according to IFPRI 10km (6 mile) landuse classification data, corn (maize) (Figure 8) and rice farmlands (Figure 9) in North Korea are mostly distributed in the southern regions of North Pyongan province. Based on these distribution maps, as of July, the corn and rice areas were outside the regions of excess rainfall and potential flood-damage risk .

In summary, this year's rice and corn crops are projected to be near or at the long-term average., Despite this positive assessment, some areas in the northwest regions have an increased chance for a below-average crop given the excess rainfall and potential flood damage in July. The European Commission's Monitoring Agricultural Resources (MARS) supports the positive outlook and reported that after a dry spell affecting the south of the country in early June, particularly in Hwanghae Namdo, the main rice producing region, North Korea received heavy rainfall from early July (twice the monthly rainfall in Hamgyong Namdo) which benefitted rice and maize crops, whose biomass (NDVI) is now close to or above average. This far into the season, MARS data shows

crop biomass ranging from average to above-average in all provinces. Throughout the 2024 crop season, MARS has issued no Anomaly Hotspots of Agricultural Production (ASAP) in North Korea.

In closing, the productivity prospects remain favorable barring no further major weather disruptions. As of the end of July, most key growing regions did not experience persistent or prolonged excess rainfall and floods through key periods for crop development. The crop season has been characterized by good levels of rainfall and soil moisture conditions in core agricultural crop planting areas, with the exception of some localized areas in northwest provinces. Widespread favorable conditions during the remainder of the season across all parts of the country's cropping regions should induce favorable end-of-season crop results.

It is also important to understand that there is always a high level of uncertainty with projections of food production and food security in North Korea. Objective assessments and projections of food production and food security always have a high degree of uncertainty since many of the political and socio-economic factors are poorly understood, coupled with a lack of on-the-ground validation and verification. This presents challenges for the timely and accurate evaluation and forecast of crop conditions and associated production. Over the years, it has generally been recognized that in North Korea the food security situation is, to a large extent, influenced by the dynamics at the border with China and by continued international economic sanctions. Since 2020, according to the World Food Program (WFP), borders have been fully closed and in-country labor mobility has been severely restricted. This resulted in severe import restrictions of food, farm inputs such as fertilizers, improved seeds, farming equipment, machinery spare parts, as well as humanitarian aid. The circumstances make it difficult to predict, with certainty, how these variables may impact final crop harvest results.

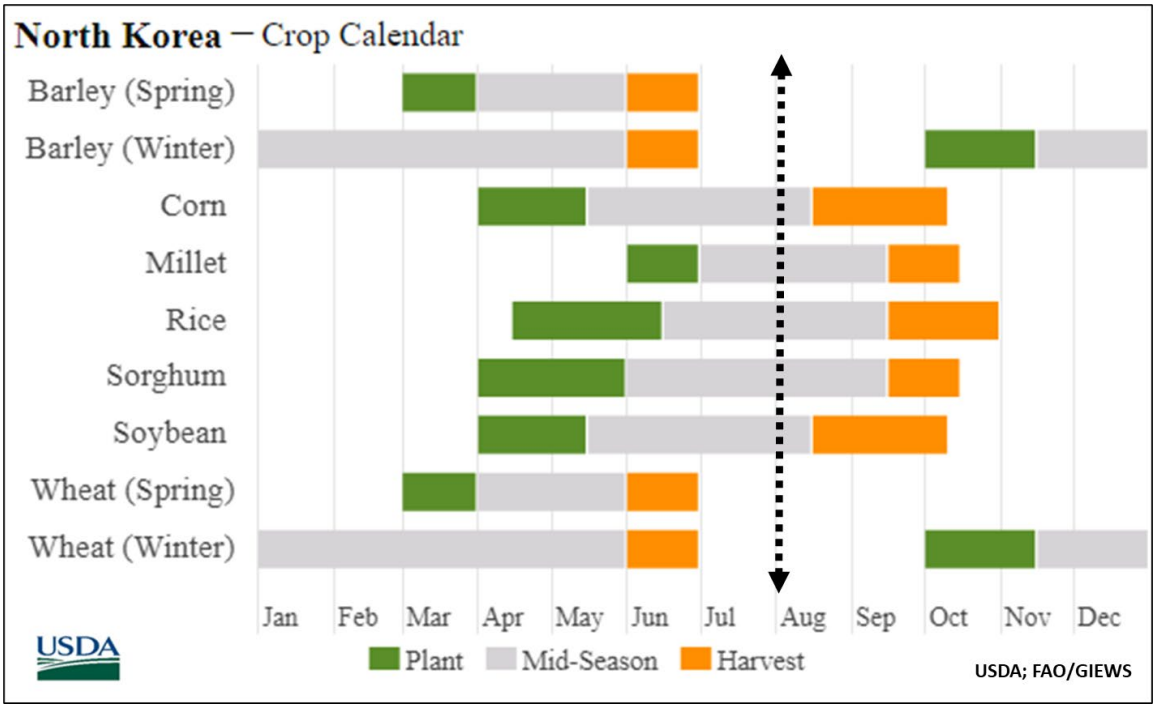



**Figure 1. Major food crops, corn and rice, are in mid-to-advanced grain filling stages; winter and spring barley harvest completed as illustrated by the dotted line. Source: FAO/GIEWS**

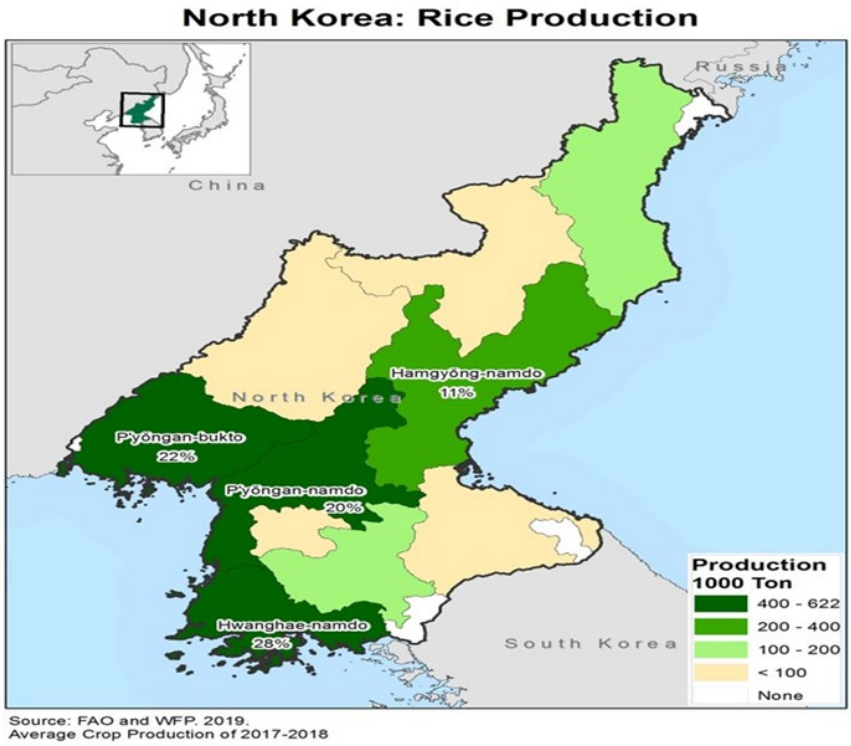



**Figure 2. The western provinces are considered the "cereal bowl regions." The map shows the percent proportion of rice produced in the western provinces. Similar trends are true for corn and other major staple food production crops. Data source: FAO - WFP**

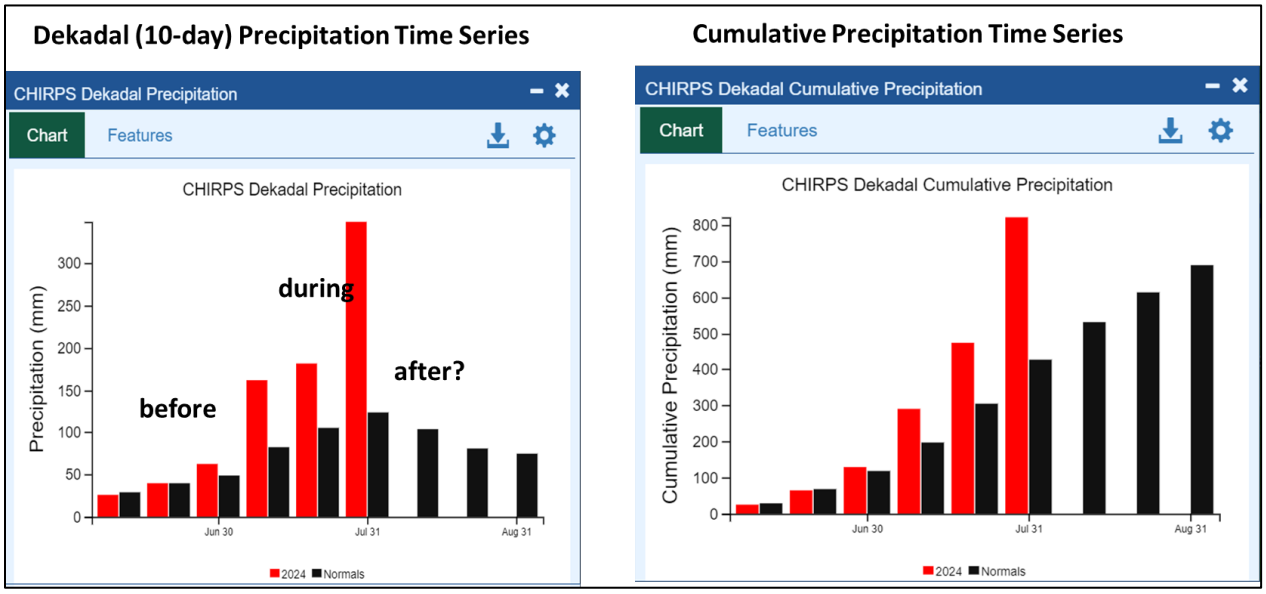



**Figure 3. The graphs show the 2024 active-season 10-day and cumulative precipitation time series. Normal-to-above-average conditions across most major production regions; providing favorable crop conditions especially in May and June. July shows significantly above normal precipitaion across major corn and rice cropping regions, predominantly contributed by excess rainfall in North Pyongan along the Chinese border and parts of South Pyongan. Source: CHIRPS**

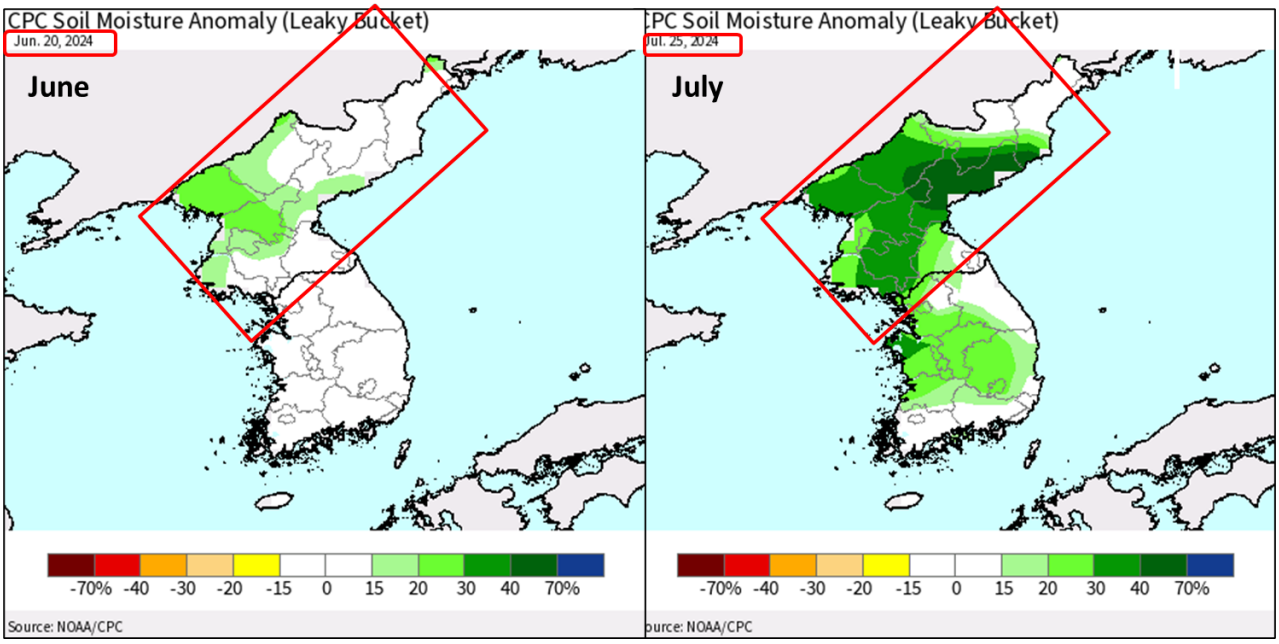



**Figure 4. The graphs show the 2024 active-season soil moisture conditions. The conditions were normal-to-above-average in June and July across most major production regions; this provided favorable crop conditions especially in June and July. July shows significantly above normal**

**conditions across major corn and rice cropping regions, especially in North Pyongan and South Pyongan provinces. Source: NOAA Climate Prediction Center (CPC)**

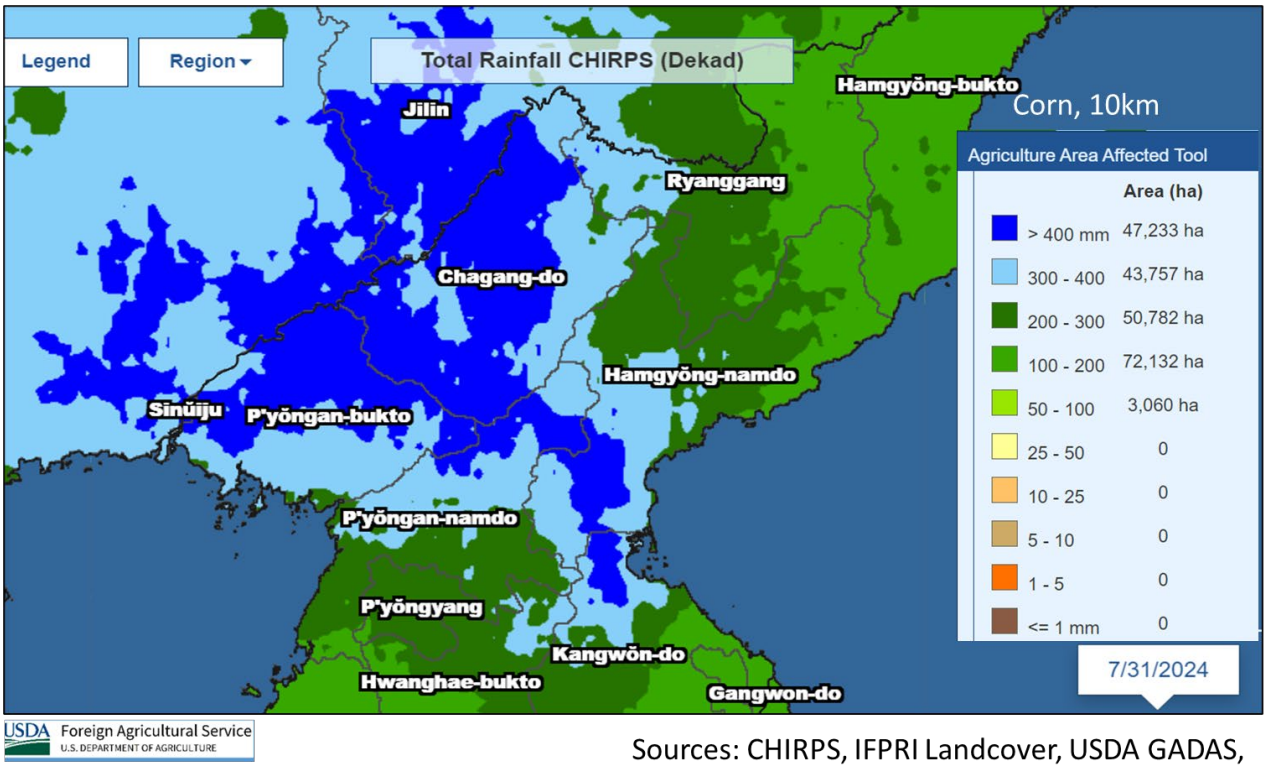
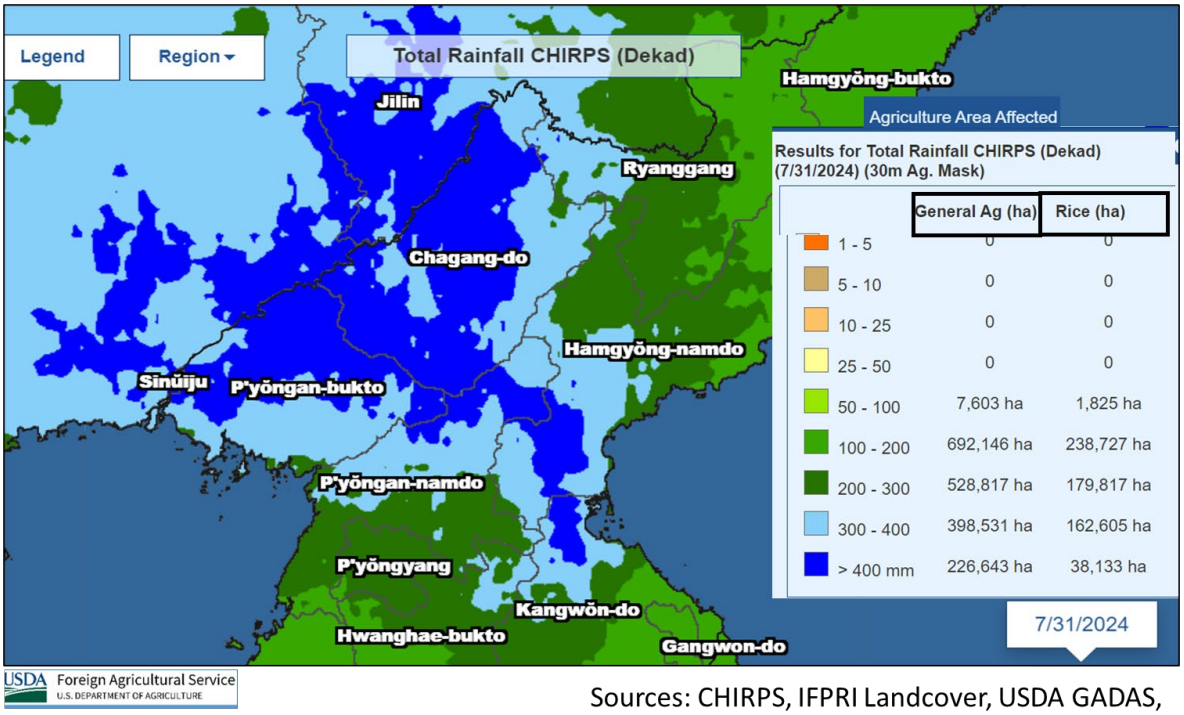



**Figure 5. As of July 31, USDA's preliminary assessment of potential agriculture area affected by excess rains (>400mm), using GADAS (Global Agricultural & Disaster Assessment System), indicated that across the nation approximately 227,000 hectares of "general agricultural land" were at potential flood-damage risk, of which 47,000 ha was potentially corn farmland. Source: CHIRPS, IFPRI, USDA GADAS**




Sources: CHIRPS, IFPRI Landcover, USDA GADAS,

**Figure 6. As of July 31, USDA's preliminary assessment of potential agriculture area affected by excess rains (>400mm) and potential flooding, using GADAS (Global Agricultural & Disaster Assessment System), indicated across the nation approximately 227,000 hectares of "general agricultural land" at potential flood-damage risk; of which 38,000 ha is potentially rice farmland. Source: CHIRPS, IFPRI, USDA GADAS**

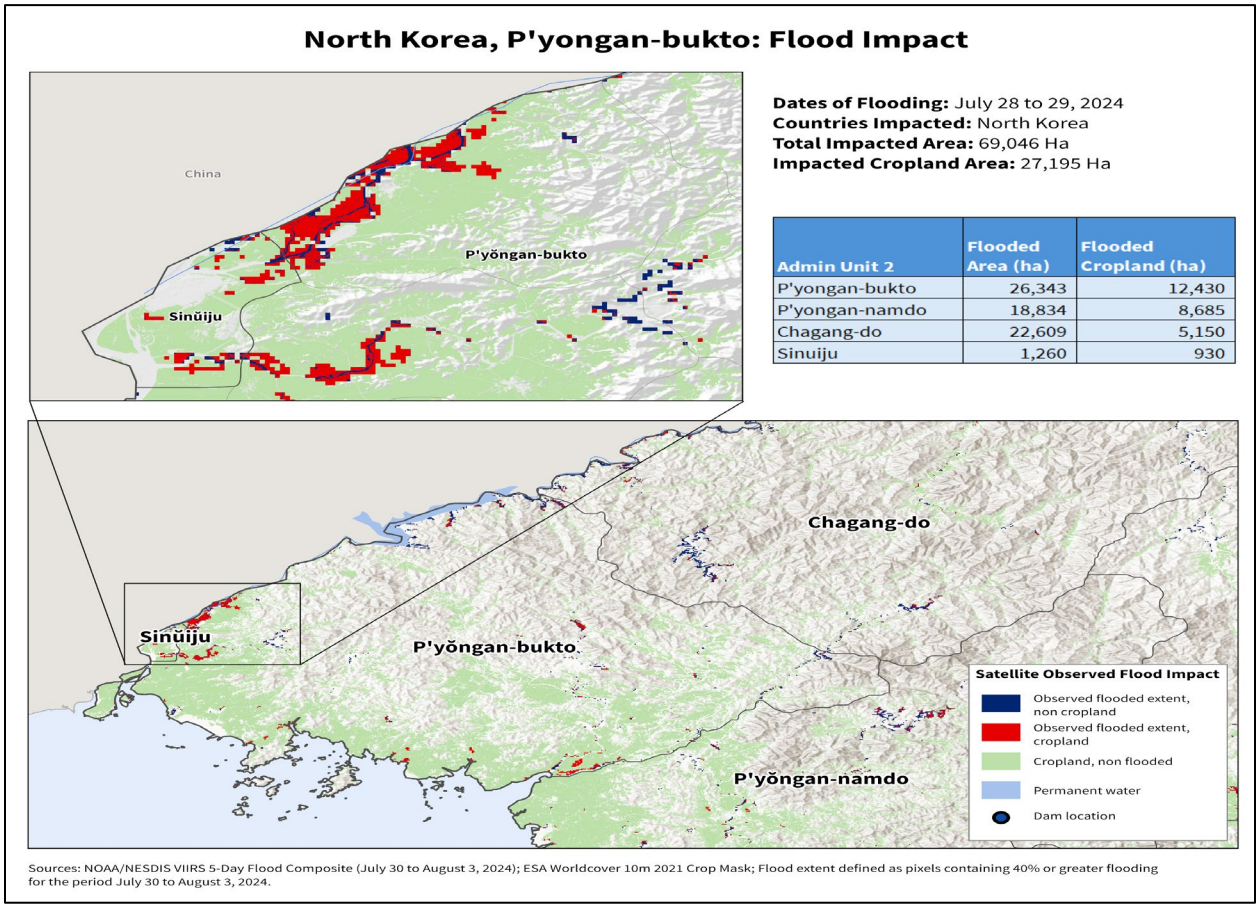



**Figure 7a. This is a map of the flood extent for North Korea covering Pyongan-bukto, Pyongan-namdo, Chagang-do, and Sinuiju. The map is based on the use of a 375-m spatial resolution NOAA/NESDIS VIIRS 5-day Flood Composite data (July 30 to August 3) and the ESA Worldcover 10-m 2021 Crop Mask. The derived product includes calculated flooded cropland area (ha) and total flooded area (ha) for the four administration units in the focus area. Source: NOAA/NESDIS**

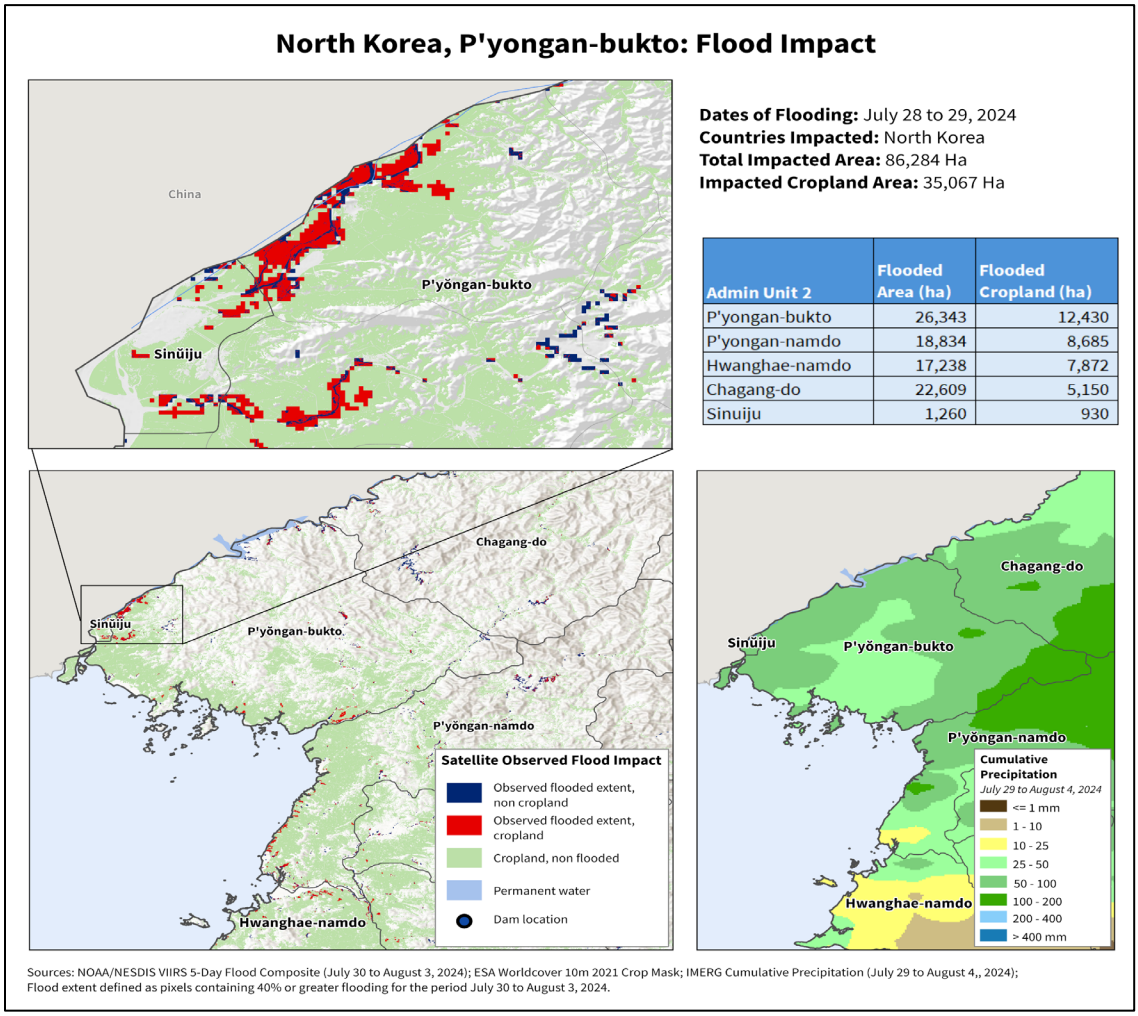



**Figure 7b. This is a map of precipitation and the flood extent for North Korea covering Pyongan-bukto, Pyongan-namdo, Chagang-do, and Sinuiju. The map is based on the use of a 375-m spatial resolution NOAA/NESDIS VIIRS 5-day Flood Composite data (July 30 to August 3) and the ESA Worldcover 10-m 2021 Crop Mask. The derived product includes calculated flooded cropland area (ha) and total flooded area (ha) for the four administration units in the focus area. Source: NOAA/NESDIS**

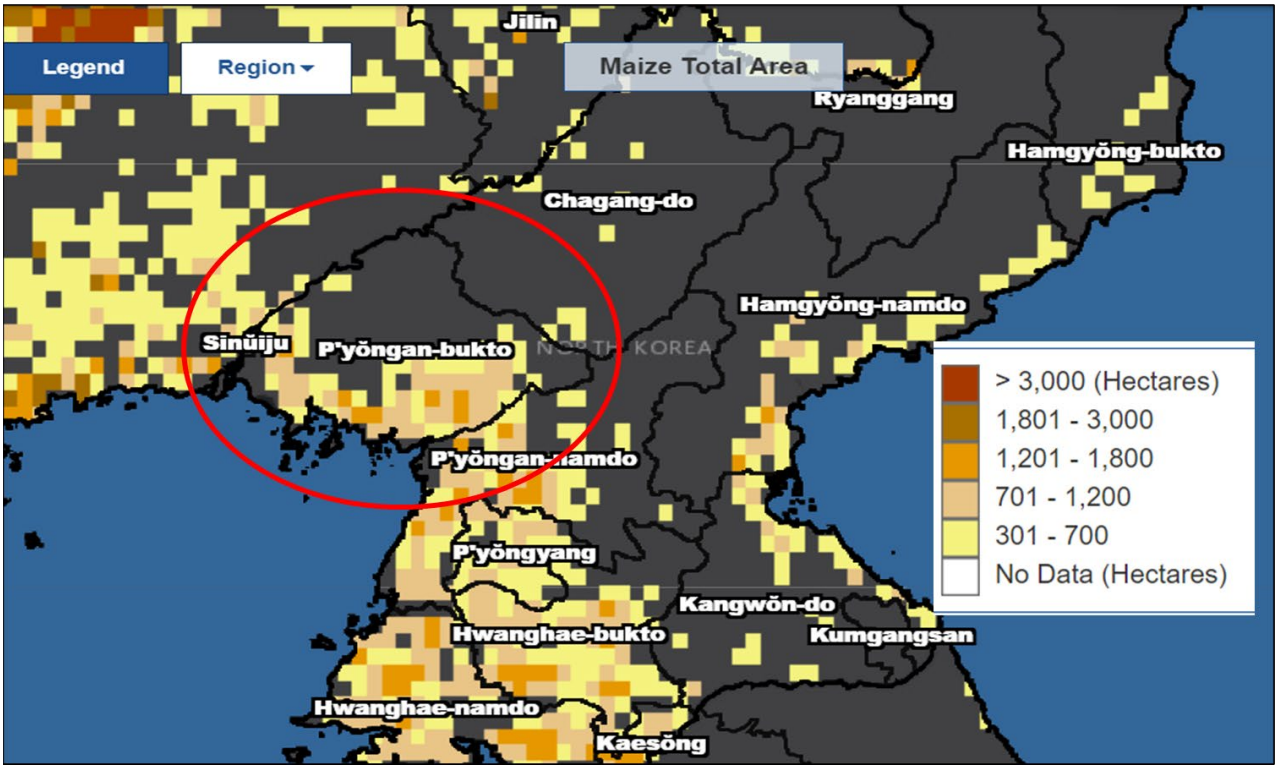



**Figure 8: The map shows a detailed view of corn (maize) farmlands distribution across North Korea. Corn farmlands are mostly in the southern regions of North Pyongan province which are outside the regions of potential flood-damage risk. Source: IFPRI, International Food Policy Research Institute (CGIAR) 10km (6 mile) Landuse classification data.**

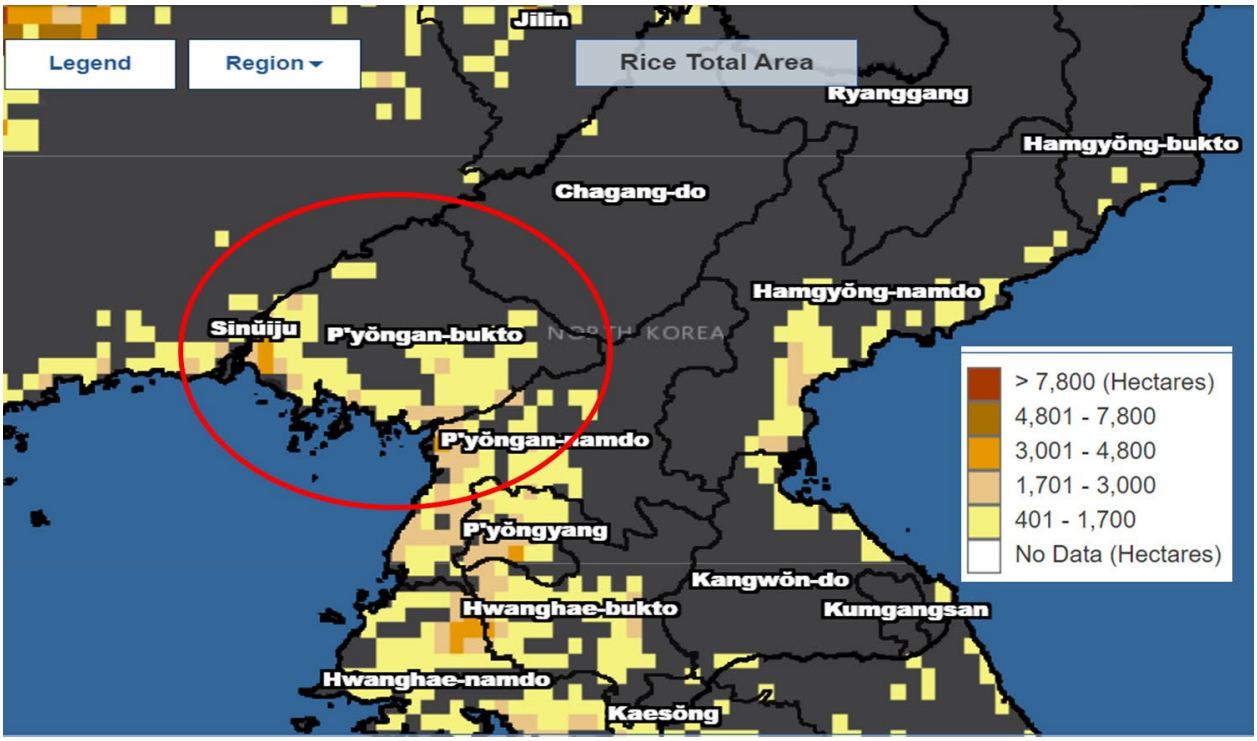


**Figure 9: The map shows a detailed view of rice farmlands distribution across North Korea. Rice farmlands are mostly in the southern regions of North Pyongan province which are outside the regions of potential flood-damage risk. Source: IFPRI, International Food Policy Research Institute (CGIAR) 10km (6 mile) Landuse classification data.**

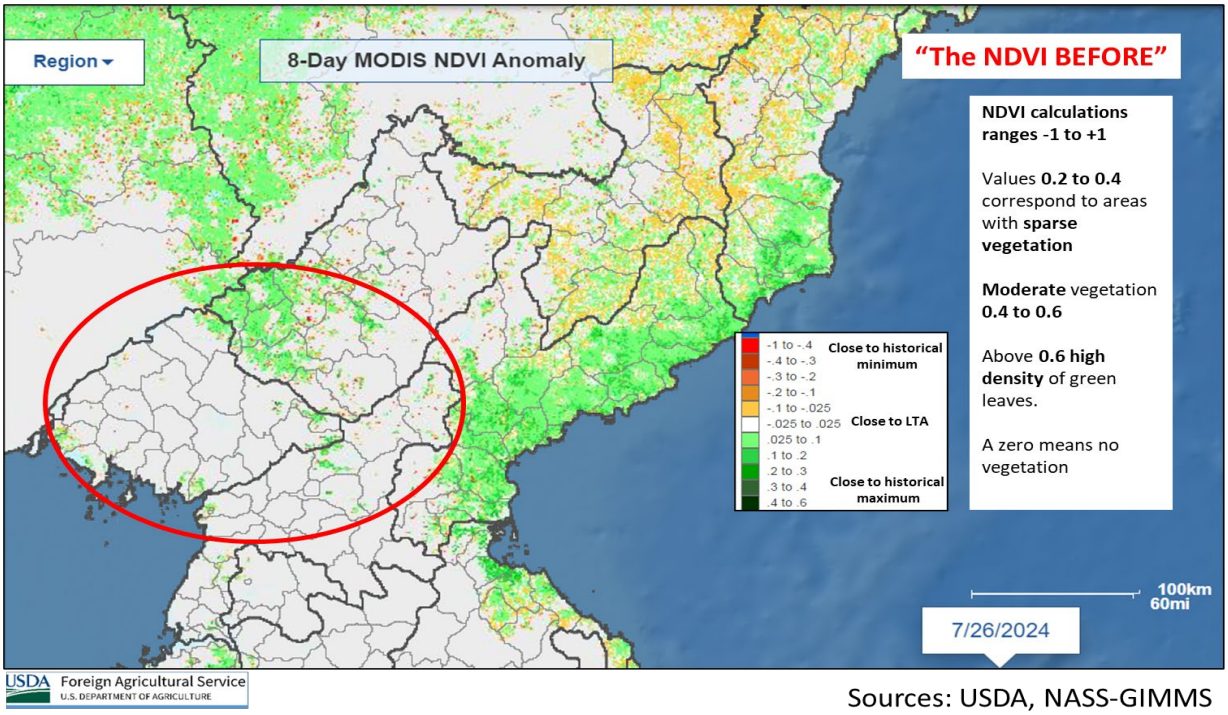



**Figure 10: The image shows the 8-day-composite MODIS NDVI Anomaly (Normalized Difference Vegetation Index) as of July 26, 2024 (before the excess rainfall/flood event that occurred July 27-28). The vegetation index is an important indicator of plant health and crop performance. The crop conditions were generally characterized as normal. Source: USDA – NASA-GIMMS**

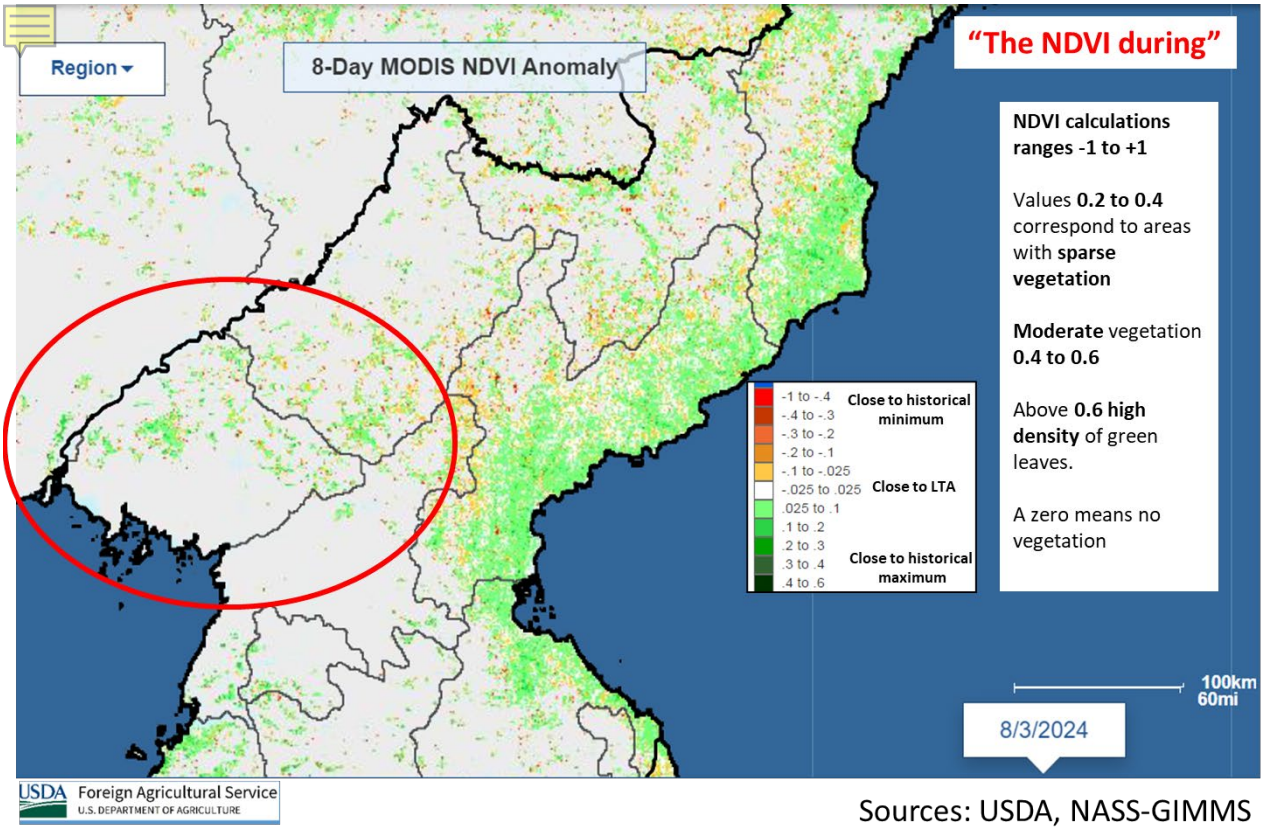



**Figure 11: The image shows the 8-day-composite MODIS NDVI Anomaly (Normalized Difference Vegetation Index) of North Korea as of August 3, 2024 (soon after the excess rainfall/flood event that occurred July 27-28). The vegetation index is an important indicator of plant health and crop performance; based on this, the crop conditions were generally characterized as normal. Source: USDA – NASA-GIMMS**

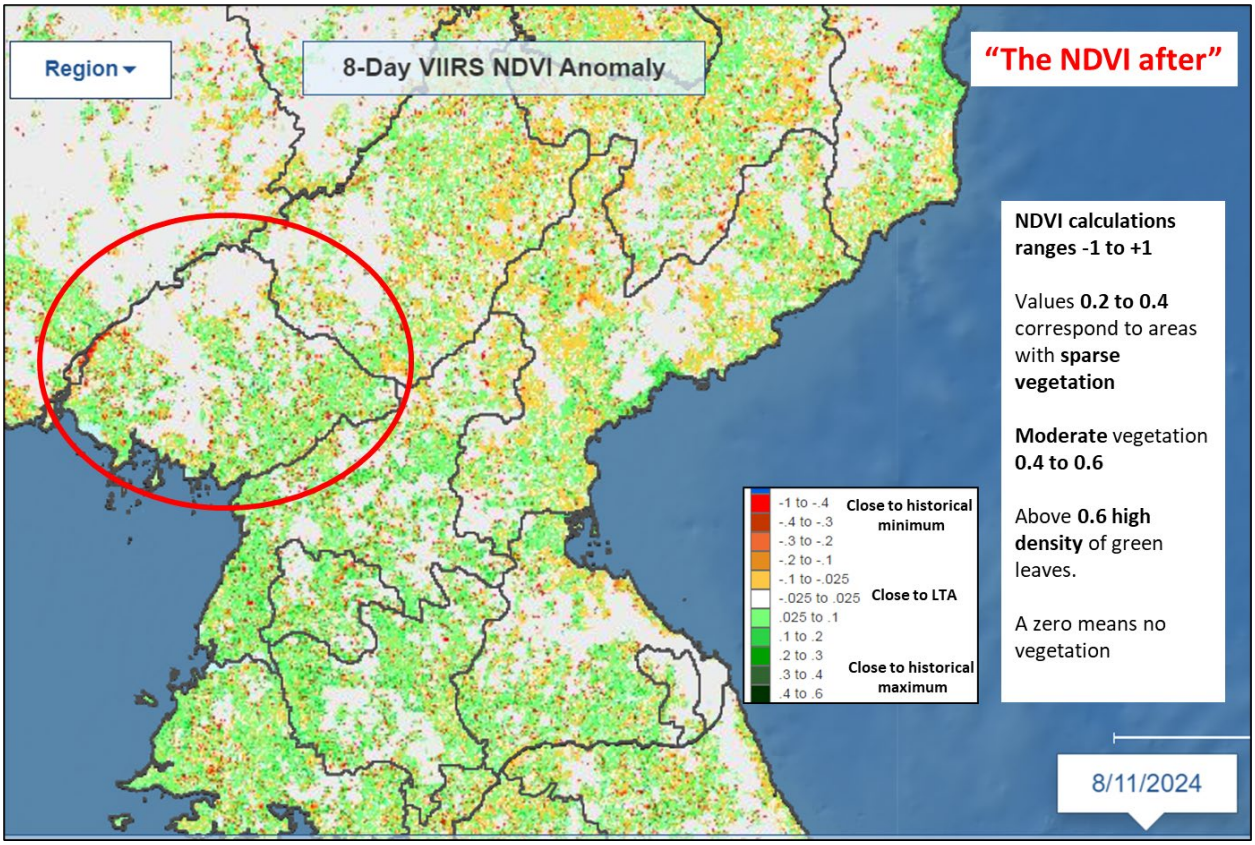



**Figure 12: The image shows the 8-day-composite VIIRS NDVI Anomaly (Normalized Difference Vegetation Index) of North Korea as of August 11, 2024 (soon after the excess rainfall/flood event that occurred July 27-28). The vegetation index is an important indicator of plant health and crop performance; based on this, the crop conditions were generally characterized as normal. The only exception is a relatively small, localized area along the North Korea – China border where the index is below the average (red). Source: USDA – NASA-GIMMS**

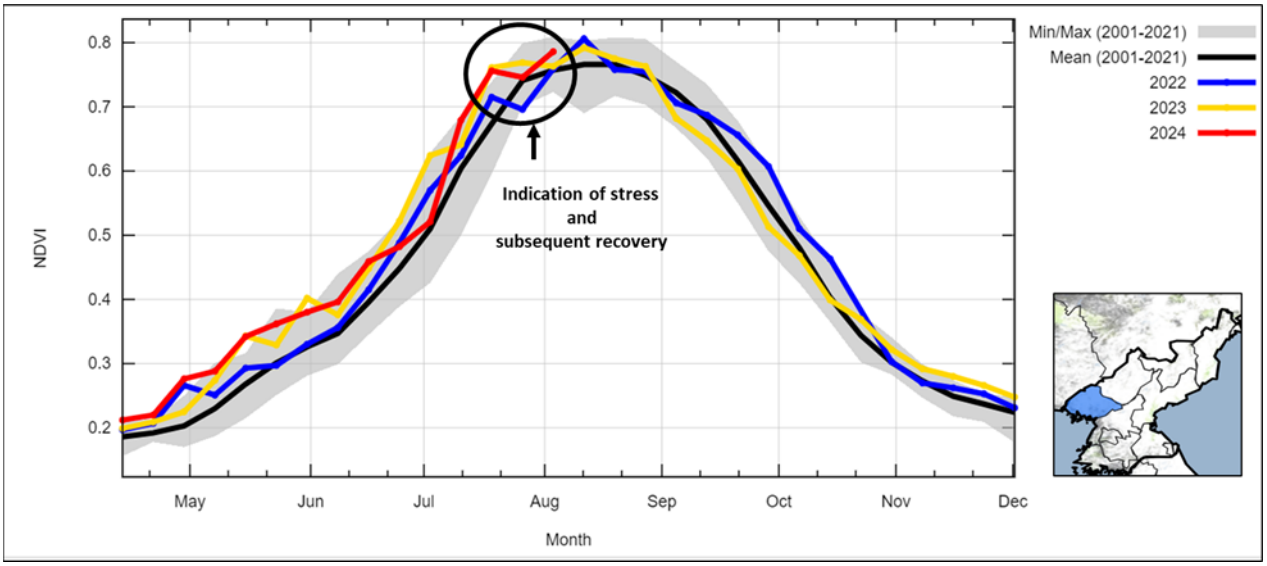


**Figure 13. Pyongan-bukto and Pyongan-namdo provinces MODIS 8-day NDVI (Normalized Difference Vegetation Index) time series graphs, May through first week in August. The NDVI time series graphs indicate favorable crop performance for the 2024 season relative to the long-term average and almost the same as the 2023 season. At the end of July, the graphs indicate stress followed by subsequent recovery. Source: USDA/NASA GLAM**

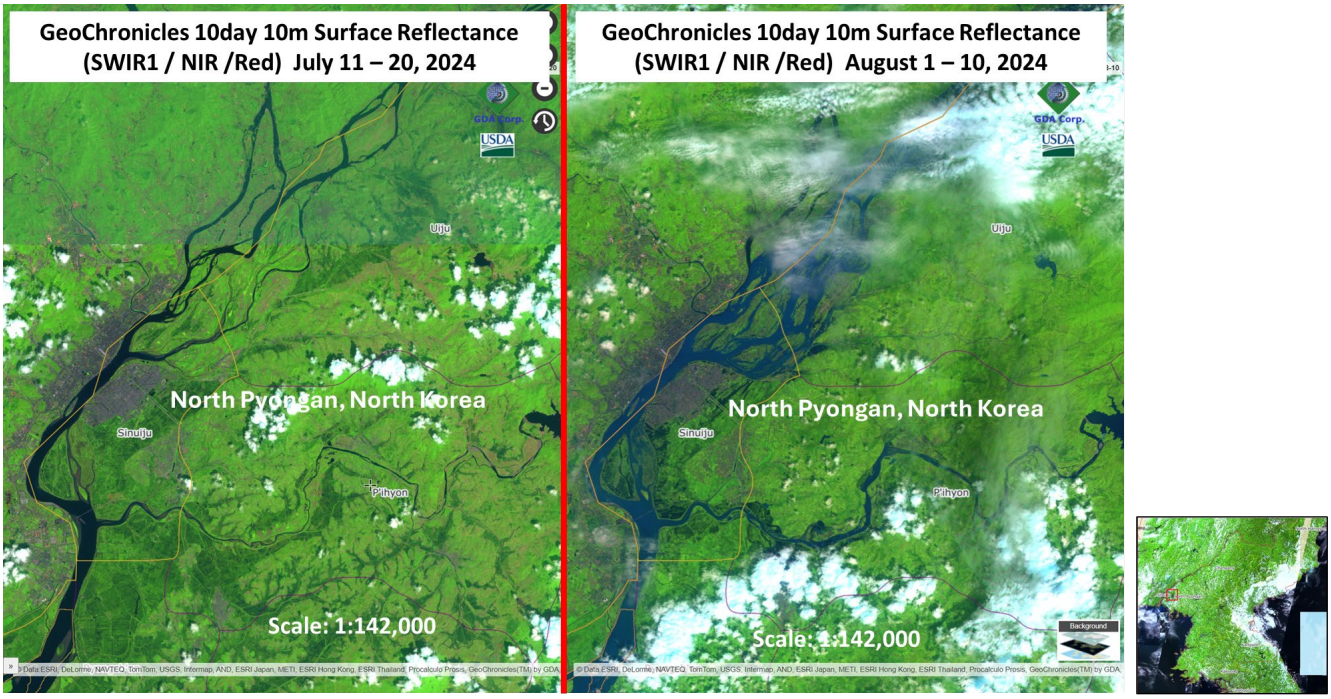



**Figure 14. Satellite observations of water levels (dark) along the rivers and the crop conditions as observed in July 11 – 20 before the excess rainfall-flooding (left) and August 1 – 10 during the event (right). This is a 10m high-resolution GeoChronical 30-day satellite imagery observations of a sample location in northwest North Pyongan province along the border with China aimed at comparing conditions of agricultural farmland across the province. The heavy rains in northwest North Korea occurred July 27-28; in early August the preliminary satellite visualization shows that in most of the locations there were no significant differences in agricultural farmland conditions before and during the excess rainfall and flood event, but the water levels along the riverbanks were elevated in August compared to July. Source: GDA Corp GeoChronicals**

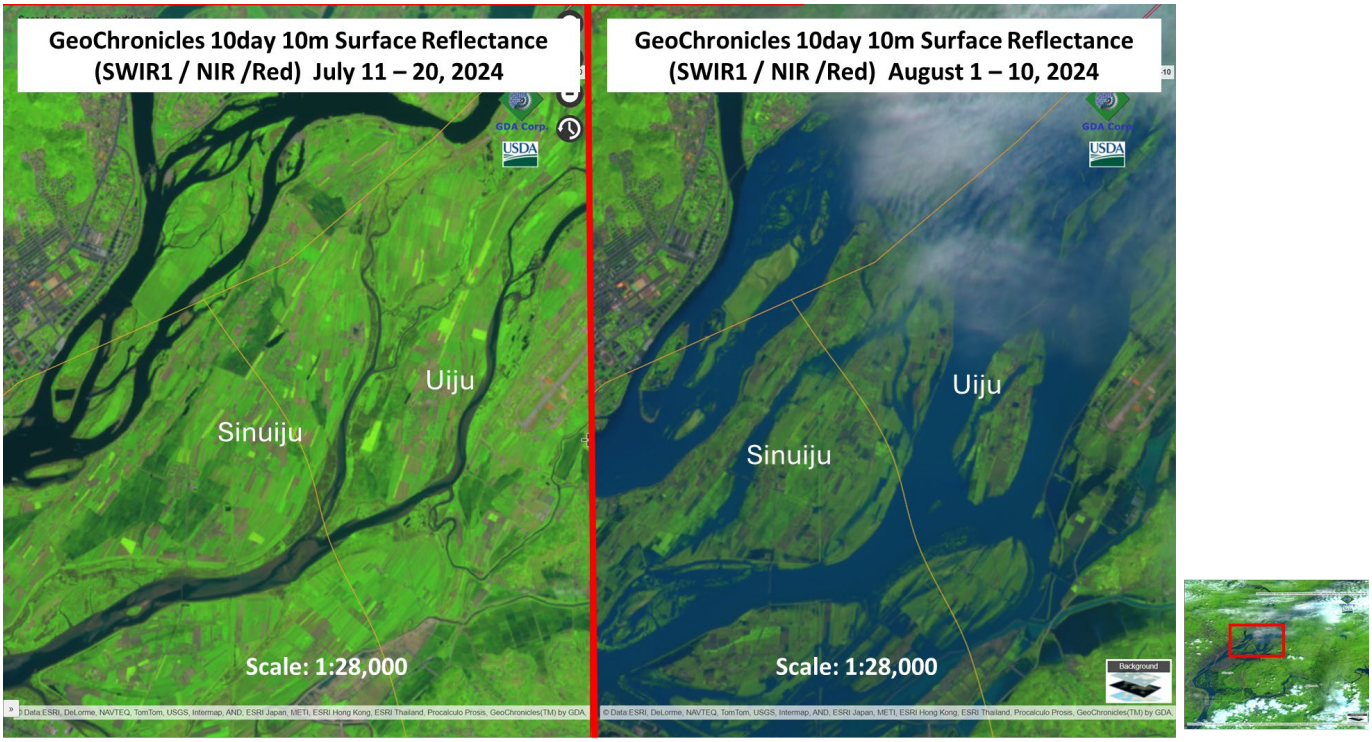



**Figure 15. This is 10m high-resolution GeoChronical 30-day satellite imagery observations of a sample location in the northwest North Pyongan regions of Sinuiju and Uiju along the border with China. This compares conditions of agricultural farmland (green) and riverbank water levels across the region in July 11 – 20 (left) before the excess rainfall-flooding and August 1 – 10 (right) during the event. The heavy rains occurred July 27-28. At the end of July into early August the preliminary satellite visualization shows that in most of the locations there were significant differences in agricultural farmland flooded along the riverbanks during the event due to the elevated flood water levels compared to July. Source: GDA Corp GeoChronicals**

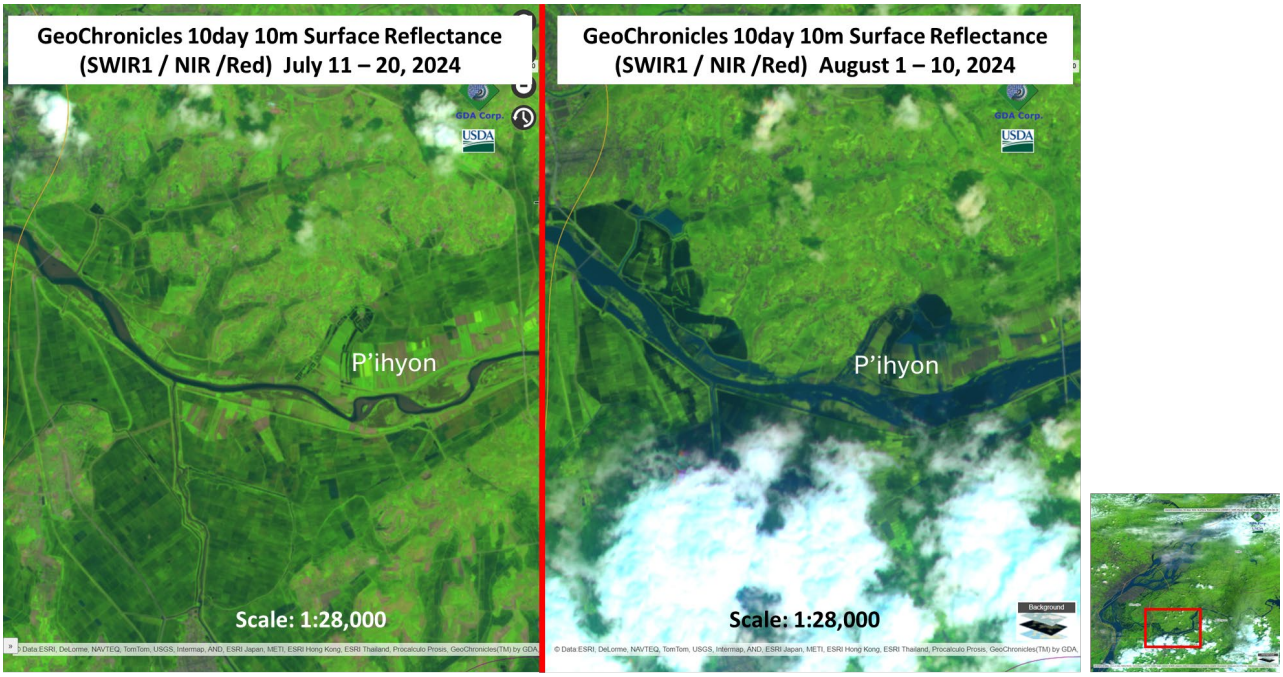



**Figure 16: This is 10m high-resolution GeoChronicals 30-day satellite imagery observation of a sample location in northwest North Pyongan, further south of Sinuiju and Uiju. This compares conditions of agricultural farmland (green), riverbank water levels (dark), and cloud cover (white) across the region from July 11 – 20 (left) before the excess rainfall-flooding, and August 1 – 10 (right) during the event. In early August the preliminary satellite visualization shows that in most of the locations there were significant differences in farmland fields flooded along the riverbanks during the event due to the elevated flood water levels compared to July just before the event. There is also intense cloud clover at the end of July into early August, as observed in the right image. Source: USDA/GDA GeoChronical. Source: GDA Corp GeoChronicals**

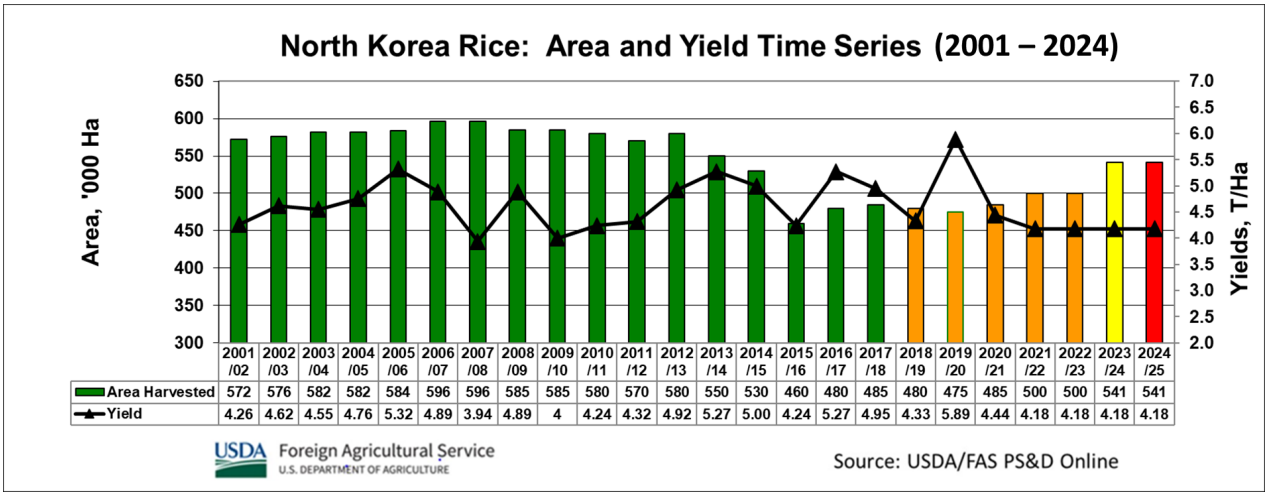



**Figure 17. The current rice yield forecast is almost 4 percent below the 5-year average of 4.76 t/ha. In recent years, the declining yield trend is primarily due to expansion of rice planted area in**

**marginal lands and poor capacity to import and distribute much-needed agricultural inputs, such as improved hybrid seeds and fertilizers. Source: USDA-PSD.**

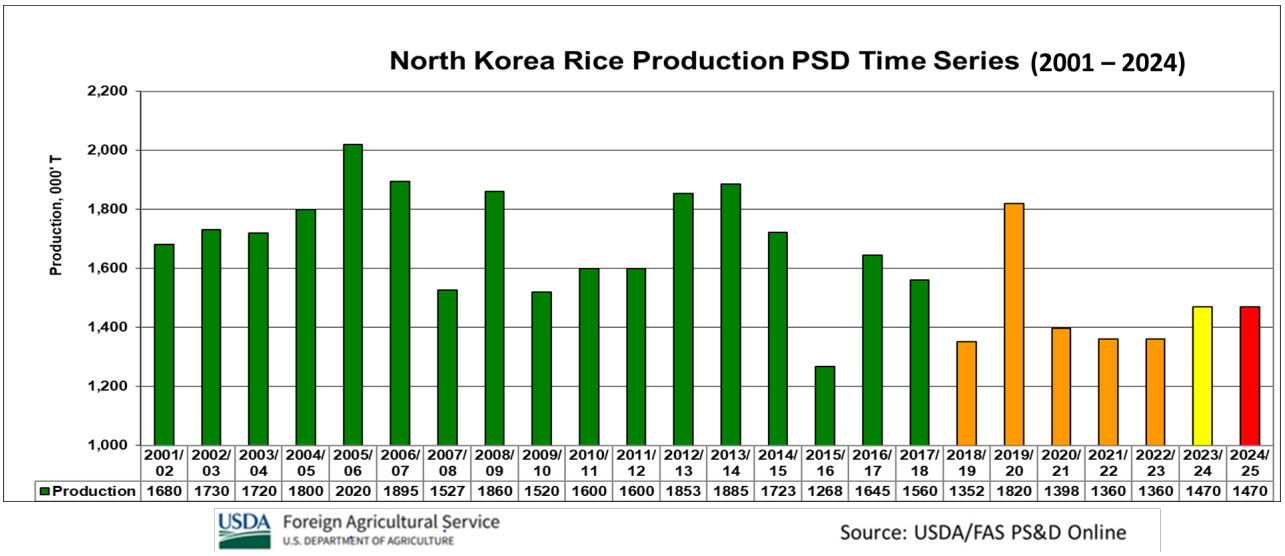



**Figure 18. The current rice production forecast is projected to be the same as in 2023, but up 8 percent from the 2022 crop and down approximately 1 percent from the 5-year average. Source: USDA-PSD.**

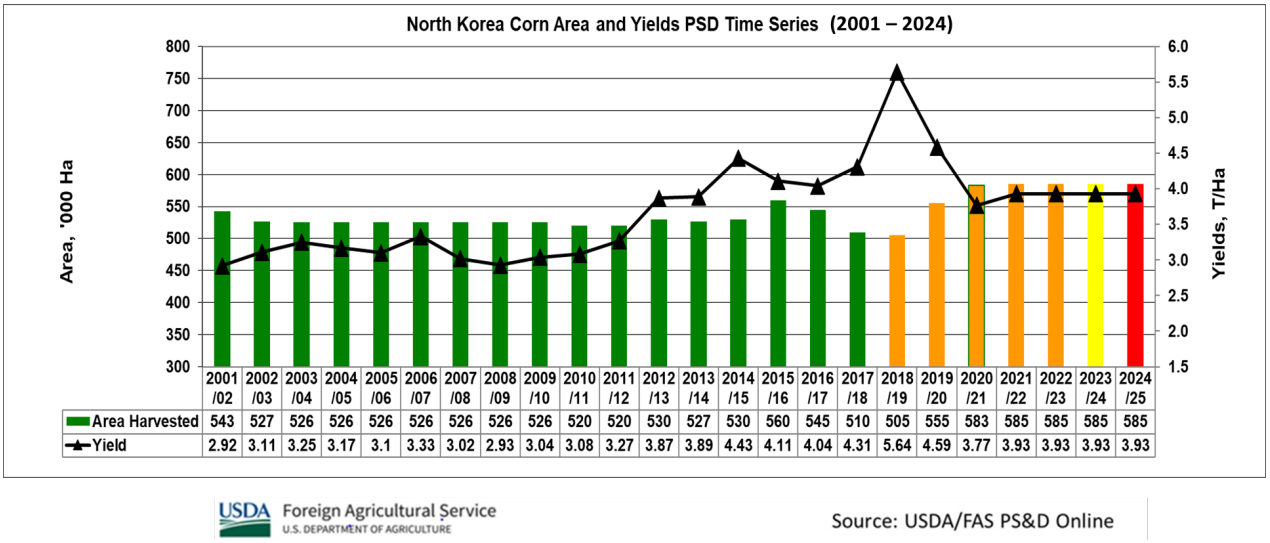



**Figure 19. The current corn yield forecast is projected to be the same as in 2023, down 2.5 percent from the 5-year average. Source: USDA-PSD.**

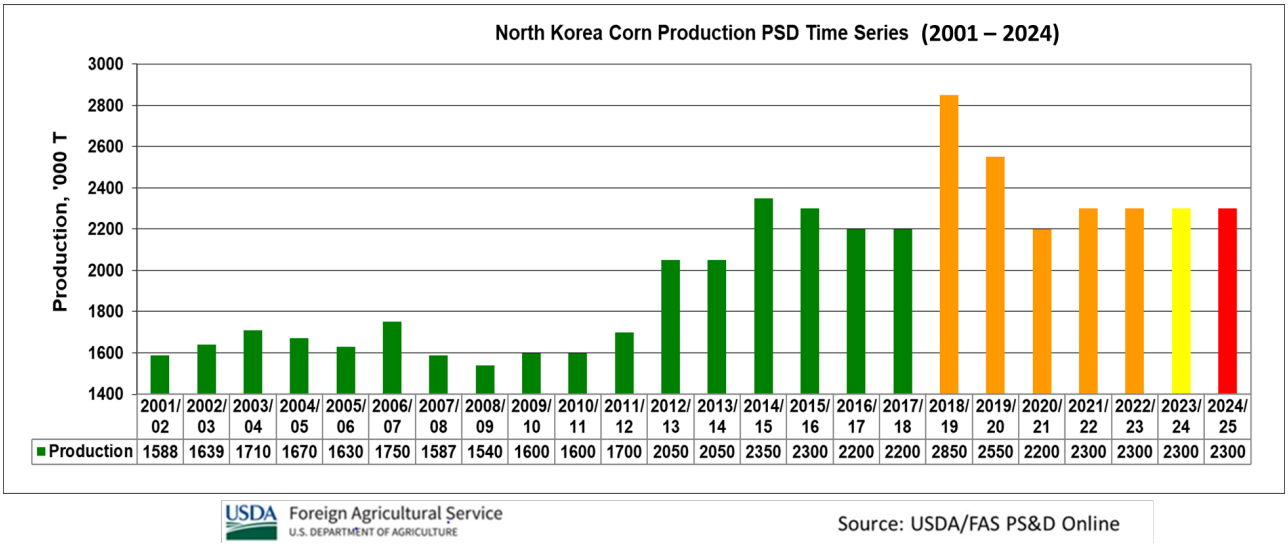



**Figure 20. The 2024 season corn production forecast is projected to be the same as in 2023, down 1 percent from the 5-year average. Source: USDA-PSD.**

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Crop Explorer
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Global Agricultural and Disaster Assessment System (GADAS)
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