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North Korean Food Insecurity: Is Famine on the Horizon?

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About the Author

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SUMMARY North Korea is a complex humanitarian emergency with food insecurity at its core. Data on grain prices and quantities depict a deteriorating situation, made worse by the regime's self-isolating response to the COVID-19 pandemic and the war in Ukraine. The grain supply appears to have fallen below minimum human needs, but the situation is neither as dire as the 1990s famine nor as severe as conditions elsewhere in the world today. Food insecurity in North Korea is not only a humanitarian issue, but it is a strategic issue as well. From the perspective of donors, given the lack of regime accountability, at the present time aid is unlikely to be an effective lever in achieving other diplomatic goals, nor does North Korea appear to be the potential recipient of greatest need.

North Korea is experiencing its worst food crisis since the great famine of the 1990s. The food crisis is the product of poor economic policy choices, the country's self-isolating response to the COVID-19 pandemic, bad weather, rising world prices, and economic sanctions. International assistance is hampered by the country's stubborn refusal to adhere to international norms and competing demands elsewhere. Yet despite these conditions, aid is unlikely to contribute to achieving other diplomatic goals such as termination of North Korea's nuclear weapon or missile programs.

The country's chronic food insecurity is the product of decades of economic mismanagement and the internal and external policies of the incumbent political regime. North Korea has pursued the understandable goal of national food security through an economically irrational policy of self-sufficiency. Local conditions for agriculture are inauspicious: the land is largely mountainous, the ratio of population to arable land is high, and the comparatively cold climate limits growing seasons and opportunities for double cropping. To offset these natural limitations, the regime developed an agricultural system intensive in the use of industrial intermediates including fertilizer, insecticide, and electrically driven irrigation systems. Agriculture was collectivized and subject to a high degree of centralized bureaucratic control. In a narrow sense, the approach has worked: most of the grain consumed in North Korea is produced domestically. But this achievement of high levels of output in the face of unfavorable environmental conditions has required reliance on imported inputs and created new sources of vulnerability. During the 1990s, the country suffered a catastrophic famine. Estimates vary widely, but perhaps 600,000–1 million people, or about 3–5 percent of the prefamine population, died as a result.¹

This complex emergency has a security dimension as well. Since 2006, the United Nations Security Council (UNSC) has passed multiple resolutions condemning North Korea's nuclear weapons and missile programs and has imposed increasingly broad economic sanctions. Despite public protestations of the insulation of humanitarian responses from diplomatic concerns

(Ronald Reagan's declaration that "a hungry child knows no politics"), food aid has been used repeatedly by the United States to encourage North Korean participation in negotiations on the missile and nuclear issues (i.e., "food for talks"), and humanitarian assistance is typically the leading edge of inter-Korean engagement.²

The global COVID-19 pandemic, and the regime's reaction to it, have made conditions worse. The country responded to the pandemic by self-isolating, tightly controlling access across its borders beginning in January 2020. The border closure further disrupted an economy already under stress from multilateral sanctions. As of August 2022, the strategy appears to have failed: the country has admitted to a major outbreak of the virus amidst an unvaccinated population. The war in Ukraine is an additional stressor.

Food insecurity again appears to be deepening. In April 2021, in a speech to the Workers Party of Korea (WPK) Cell Secretaries, North Korean leader Kim Jong-un invoked the "Arduous March"—code language for the 1990s famine. He returned to the food security theme in his December 2021 address before the WPK's central committee, eschewing belligerence and emphasizing the central goal of rehabilitating the rural economy and achieving national food security—in the long run.

But the country's opacity impairs both the assessment of humanitarian needs and the calibration of its possible diplomatic relevance. This essay triangulates quantity, price, and other forms of evidence to assess food insecurity in North Korea. All indicators point to deteriorating conditions. Thus far it does not appear that this degree of distress has become diplomatically salient, but under the continuing stresses of the COVID-19 pandemic and the war in Ukraine, further deterioration of internal conditions could put humanitarian relief back on the political agenda.

Quantity Balances

The conventional starting point for assessing food needs is a quantity balance sheet. Total need consists of requirements for human consumption (food use), seed requirements, feed use, post-

In the face of the country's opacity, a triangulation of quantity, price, and other evidence assesses food insecurity in North Korea

harvest losses, and stock build-up. Domestic supply consists of production and any draw-down on accumulated stocks. The gap between domestic needs and supply is the uncovered food balance, which must be met through commercial imports or aid. Terminology and categorization have evolved slightly since the Food and Agriculture Organization/World Food Programme (FAO/WFP) began producing these balance sheets in 1995, but the basic structure of the balance has not.

There is a certain degree of uncertainty associated with each of these components in the North Korean case, with human food requirements and the size of the domestic harvest having the greatest quantitative relevance. These assessments are produced when the UN agencies are invited in by the North Koreans. Occasional interruptions in engagement have occurred, the present being a case in point. That presents a significant risk, impeding the ability of the outside world to recognize the onset of food distress and for aid to enter the country in a timely and targeted way.

Minimum consumption needs are estimated by imputing per capita consumption or caloric intake (controlling for the heterogeneity of need across demographic groups) and multiplying by the population estimate. During the 1990s, considerable uncertainty surrounded the size of the North Korean population; in more recent years, estimates of the North Korean population have converged across sources, and, for the purposes of this calculation, the UN estimate is accepted at face value.

Differing assumptions regarding caloric needs and nutritional sources can generate significantly divergent estimates of human needs, however. Heather Smith's 1998 comprehensive analysis³ of North Korea's historical consumption patterns of all food categories concludes that "the share of rice and maize in total cereal intake has historically been much lower than assumed by international agencies" and that the cereals consumption figure adopted by the FAO/WFP probably overstated their role in the North Korean diet by approximately 20 percent.⁴

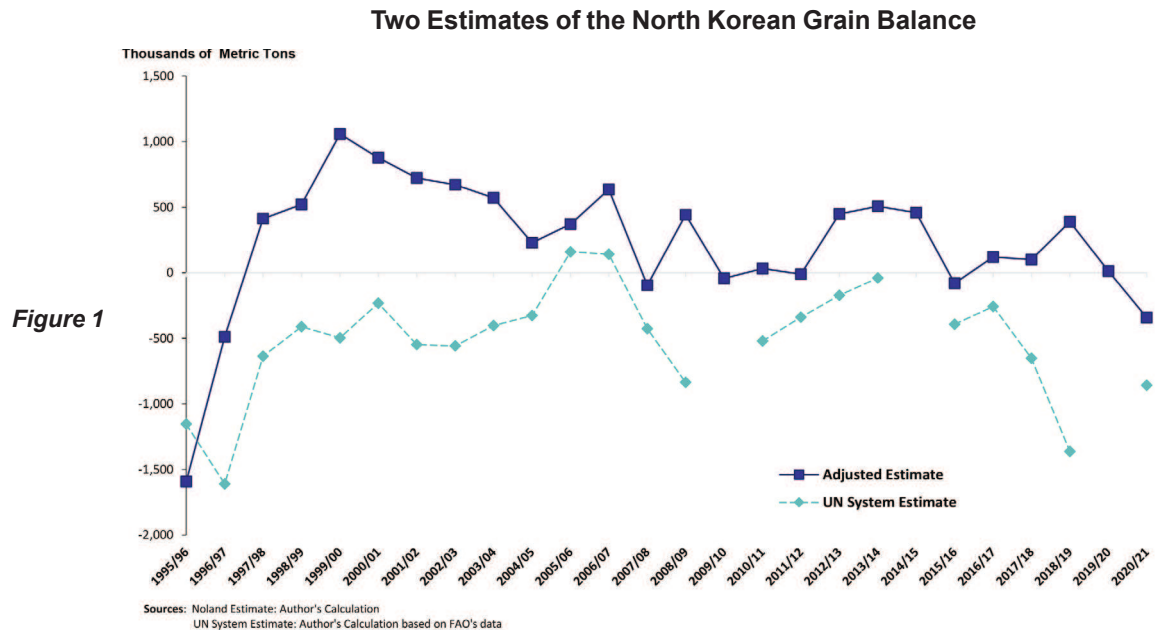
The largest source of supply uncertainty is domestic production. There are three sources of

production estimates. The FAO uses selective field sampling to generate estimates of yields, yet due to the agency's official status, is also diplomatically constrained to acknowledge North Korean official representations. This dynamic is important insofar as North Korea has shown a past tendency to understate supply during bad times to maximize assistance. In the spring of 2008, for example, the FAO downwardly revised its estimate of the previous harvest by a whopping 25 percent.

Unlike the FAO, the United States Department of Agriculture (USDA) and the (South) Korean Rural Development Administration (KRDA) do not have direct access to North Korea but are also free to ignore North Korean official figures. They rely primarily on satellite imagery (including thermal imagery to estimate yields) and in the case of the South Korean government, the operation of experimental farms mimicking North Korean agricultural techniques. These two series are highly correlated but differ from the FAO series which exhibits higher volatility.

Figure 1 reports alternative estimates of North Korea's net grain balance position. One is constructed from FAO/WFP figures. The other adjusts these estimates on the supply side by substituting the USDA estimate of North Korean production for the FAO estimate and using the Smith-adjusted estimates of human consumption on the demand side. The UN series are not plausible. According to these figures, *North Korea has avoided food shortages in only two of the last 25 years*. If North Korea experienced the chronic shortfalls depicted by this series, it would have been in near-famine conditions almost continuously for a quarter-century, an outcome contradicted by direct observation. The adjusted figures tell a more plausible story. The very large food deficits during the famine period in the mid-1990s were followed by a modest agricultural recovery and small surpluses. After 2005, however, the combination of declining domestic production, higher global prices, and more erratic aid pushed available supply below even adjusted total needs. That was followed by a weak recovery, and in the 2020–21 harvest cycle, a fall back into deficit territory, though not on the scale of the 1990s famine.

Differing assumptions regarding caloric needs and nutritional sources can generate significantly divergent estimates of human needs



Nor does North Korea appear to be the country facing the gravest challenge. The WFP lists Afghanistan, Somalia, Niger, and Mali as the countries with the most acute food insecurity today.⁵ Their assessment is backed up by eyewitness accounts of hunger-related deaths and near-famine conditions. While conditions in North Korea are bad and deteriorating, there appear to be contemporaneous cases that are worse.

The quantity rationing system broke down during the famine, and by the mid-1990s, most North Koreans reported buying most of their food in the market

Price Evidence

Historically food was distributed through a quantity rationing system called the Public Distribution System. That institution broke down during the stresses of the famine period, and by the mid-1990s, the majority of North Koreans reported purchasing most of their food in the market. Prices matter.

North Korean authorities impede the collection and dissemination of price data, but two NGOs, Seoul-based *DailyNK* and Osaka-based *AsiaPress*, use informants to collect and report prices.

DailyNK reports corn and rice price prices for three cities: Pyongyang, Sinuiju, and Hyesan (figure 2). Pyongyang is the inland capital city where most of the wealth is. Sinuiju is in North Pyongan province across the Yalu River from the Chinese city of Dandong. It is the primary over-

land transit point for trade between North Korea and China. Much of the trade transiting through Sinuiju ends up in Pyongyang. Hyesan is a relatively small border city in Ryanggang Province. The source reports prices for rice and corn, as well as the unofficial parallel exchange rate for the US dollar and Chinese RMB.

AsiaPress publishes a single figure for the country, derived from multiple collection points. The sample periods are shorter than for *DailyNK*, starting in October 2017, except for the dollar-won exchange rate, for which the sample period begins in September 2018. There is an imperfect overlap in the data collection locations and sample periods across two sources, but both cover the January 2020 border closure and a bout of renewed instability beginning in October 2020, apparently associated with the country running out of specialized paper and ink used to print currency and instead issuing scrip. The price series for rice and corn are shown in the two graphs in figure 2, averaging the three *DailyNK* cities in the interest of comprehensibility.

North Korean internal food prices appear to be higher than global prices, sometimes by a large margin, and this divergence widened significantly beginning in early 2021. Similar results are obtained if Chinese prices are used instead of world prices. The correlations both across the

The corn-rice relative price can be interpreted as a signal of household distress

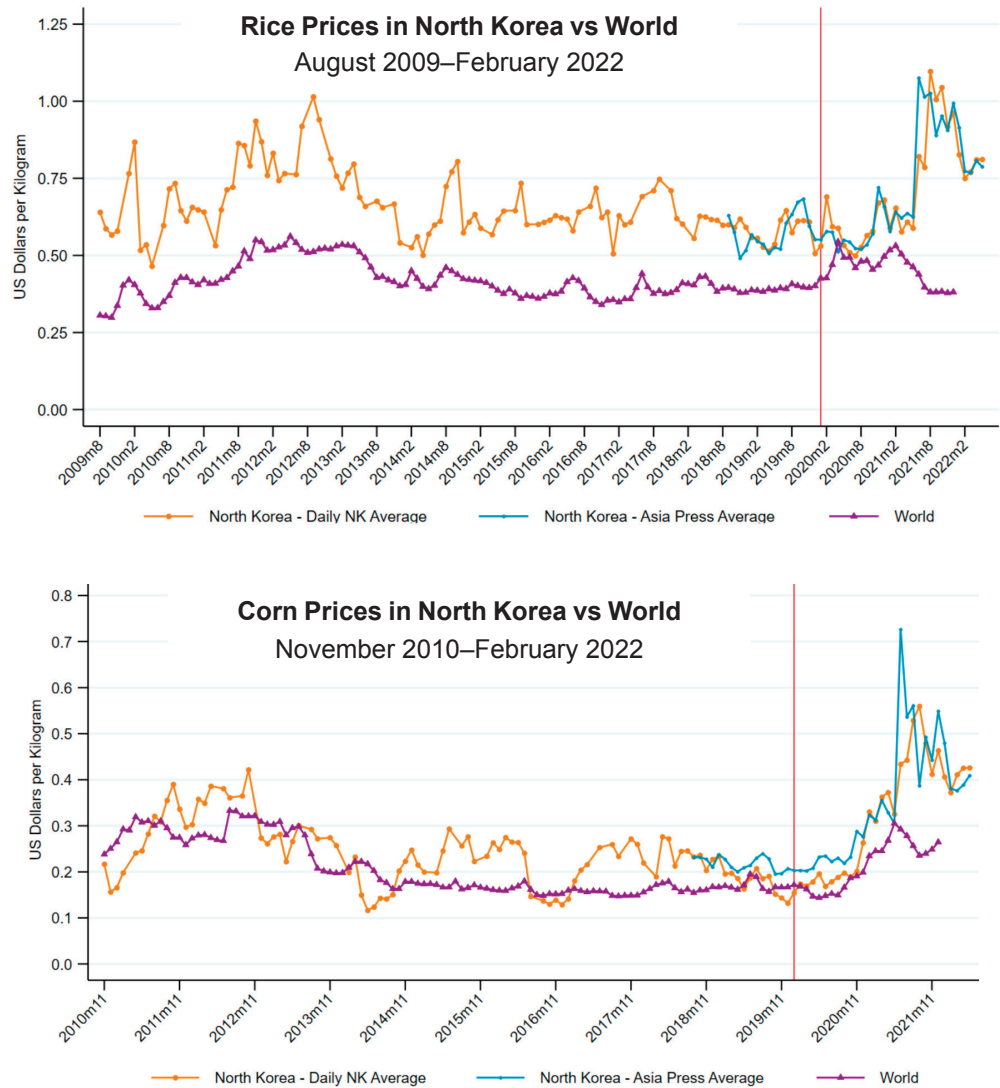


Figure 2

Sources: *Asia Press; Daily NK; World Bank.*

Note: The vertical red line indicates the January 2020 border closure.

two sources, as well as across the three cities in the *DailyNK* data, are lower for grains, which would be more difficult to arbitrage and may embody quality differences, than for the exchange rates, as might be expected. There is also some evidence that the process of spatial market integration—the process of creating a genuine national market as distinct from regional markets—may have been reversed by the pandemic-related border closure.⁶

The border closure and the subsequent issuance of scrip appear to have contributed to price volatility as well. Much of the increase in dispersion of the rice price is generated by observations collected in Hyesan. The main overland import supply route runs from Sinuiju to Pyongyang;

imports and/or aid may have stabilized prices along this conduit (particularly for the politically privileged capital city), but not in less-favored areas.

The corn-rice relative price can be interpreted as a signal of household distress. As the real price of rice rises, households shift to less preferred grains such as corn, barley, and millet, and even foraging. Figure 3 reveals some upward drift in this relative price following the border closure. Both world and Chinese rice prices have been stable relative to other cereals, however, and consequently, the relative price of corn has been rising in external markets. It is not clear whether the rising corn-rice relative price internally is signaling distress or just reflects external market conditions.

The North Korean government systematically impedes access of foreign observers, including relief agencies

Other forms of evidence

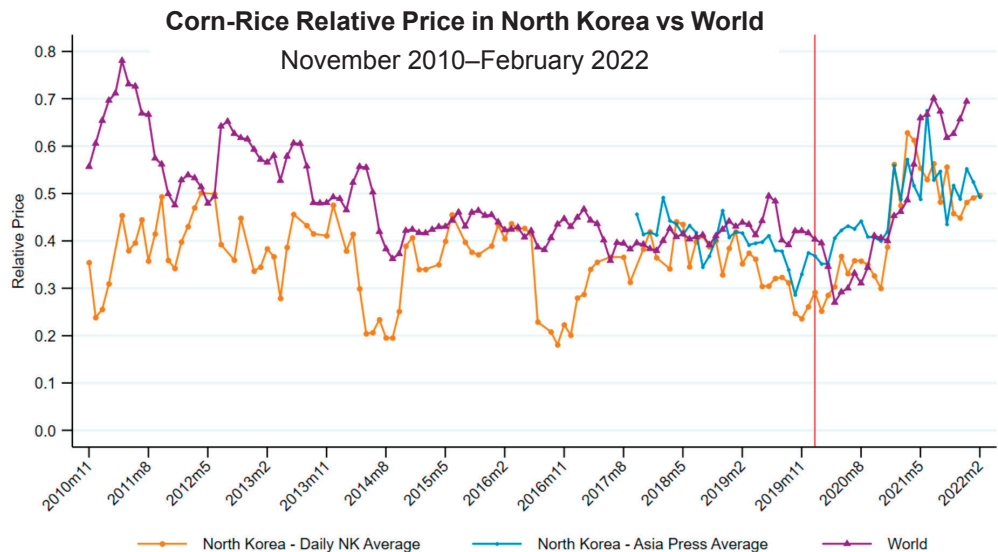
It would be desirable to have direct observation; particularly insofar as considerable evidence documents the nonuniformity of distress across geographical regions and political-economic classes. Unfortunately, the North Korean government systematically impedes access of foreign observers, including relief agencies, rendering even their efforts to collect data on conditions suspect. Access by relief agencies probably peaked around 2008, and with the subsequent diminution of aid volumes, North Korea responded by curtailing access. The border closure associated with the pandemic ended access by foreign staff entirely.

While opportunities for direct observation declined, commercial satellite imagery became more widely available. The Korean peninsula

experiences summer monsoons that are associated with flooding. That historical pattern intensified in the 1990s as marginal land was brought into cultivation, and in the context of the summer monsoon rainfall pattern on the Korean peninsula, flooding worsened.

In conjunction with meteorological data, satellite imagery can be useful in determining the geographical incidence of flooding, and whether it has affected important growing areas (and thus might materially impact the aggregate harvest) or whether it has hit food-deficit regions that might not have a large impact on the overall harvest (as appears to have been the case in 2021), but could portend localized hunger, particularly if the pattern of interregional transfers breaks down.⁷ So, for example, in 2021 the flooding and associated destruction of infrastructure appear to have

Figure 3



Sources: Asia Press; Daily NK; World Bank.

Note: The vertical red line indicates the January 2020 border closure.

been most severe in grain net deficit in North and South Hamgyong provinces and adjacent Ryanggang province, but there were anecdotal reports that traders were transporting grain into these regions in response to elevated prices. In short, natural disasters have contributed to food insecurity, but they are not the primary driver.

Outlook

In this essay, three forms of evidence—quantity, price, and satellite imagery—have been triangulated to assess food insecurity in North Korea. All three forms of evidence point to deteriorating conditions under the multiple stresses of

North Korea's self-isolating response to the global COVID-19 pandemic, pre-existing multilateral sanctions, and now the war in Ukraine. Even under relatively optimistic assumptions, food availability appears to have fallen below the level required to satisfy minimum human needs, though not to the degree observed during the 1990s famine period, nor do conditions appear to be as bad as those observed in some other countries. Prices have risen steeply, and by magnitudes that cannot be explained by the contemporaneous increase in global or Chinese grain prices alone. Finally, satellite imagery confirms flood damage. The worst affected regions appear to be outside the primary grain-growing areas. This means that while the floods may not have had a major impact on the overall size of the harvest, they may intensify difficulties experienced in affected areas.

To these stresses, the war in Ukraine and the advent of the COVID-19 pandemic can be added. The former is likely to worsen food availability in North Korea. The war has contributed to a rise in food and energy prices globally. North Korea is a net importer of food and energy (and fertilizer, which is energy-intensive in production), so these price movements represent a deterioration in the country's terms of trade.

There may be some offsetting effects, however. While energy prices are rising, Chinese refiners are reportedly importing Russian oil at significantly discounted prices, and it is conceivable that North Korea could benefit from a partial passthrough of this windfall. Historically, coal has been North Korea's largest export, with approximately 95 percent of it going to China. Although that trade has been banned by the UNSC, it continues surreptitiously, albeit at diminished volumes and discounted prices. If in response to rising energy prices, China slows the decommissioning of coal-fired power plants, Chinese demand for North Korean coal could rise.

North Korea also has a history of supplying personnel and weaponry to civil wars with Russian involvement including in Vietnam, Ethiopia, and Syria. It is conceivable that as the Russian war effort in Ukraine grinds on, North Korea could become a supplier of personnel, and even equipment, to the Russian war effort, though as in the

case of coal, this would be a violation of UNSC resolutions. In short, the global rise in food and energy prices is bad news for North Korea, but some of the terms of trade impact might be offset through idiosyncratic channels.

Finally, North Korea has admitted that the COVID-19 pandemic has arrived, though given the apparent lack of testing capability, the official figures (which would be subject to skepticism in the best of circumstances) are unusually uncertain. The government has imposed a countrywide lockdown. From a food security standpoint, it comes at an inopportune time of the year, when workers would normally be mobilized to participate in the harvesting of winter crops and participate in the planting of rice. How these activities will be managed under the lockdown is unclear.

The government has repeatedly refused offers of vaccines from multiple potential donors, though it has accepted personal protective equipment from China. That said, the pandemic is hitting an immunologically naïve population that is afflicted by hunger and extraordinarily high rates of tuberculosis.

Yet North Korea continues to develop weapons of mass destruction and delivery systems, apparently test launching an intercontinental ballistic missile (ICBM) in May 2022. Under such circumstances, it is understandable if countries seek to link the provision of humanitarian assistance with other diplomatic goals. At present, the efficacy of aid as a diplomatic lever to achieve other aims would appear to be low, however. North Korea appears to be committed to its nuclear posture, and the lack of accountability allows the regime to prioritize its narrow goals to the detriment of broader societal concerns to an uncommon, if not unprecedented, degree. Moreover, tensions between the West and China and Russia are such that any linkage policy would be subject to enormous coordination problems. To wit, following the May 2022 ICBM test, Russia and China vetoed a UNSC resolution to tighten economic sanctions. And in any event, North Korea does not appear to be the potential aid recipient of greatest need.

North Korea presents the world with an ongoing complex humanitarian emergency

The long-run solution to food insecurity lies in a resolution of the nuclear issue, removal of economic sanctions, and initiation of domestic economic reforms

with food insecurity at its core. The long-run solution to the country's chronic food insecurity lies in a resolution of the nuclear issue, removal of economic sanctions, and the initiation of domestic economic reforms. Such policy changes would allow North Korea to export industrial products and tradable services, earn foreign exchange, and import bulk grains on a commercially sustainable basis, just as its neighbors South Korea, Japan, and China do.

Whether that solution is attainable under the incumbent political regime is an open question. The examples of China and Vietnam suggest that economic reform can be under-

taken without destabilizing incumbent communist regimes, though, at the time that each initiated their respective reforms, neither country maintained external relations as fraught as North Korea does today. The outstanding issue would seem to be the willingness of the present North Korean regime to pursue that path, or whether the foreign and domestic policy commitments of the current regime, together with enablement by China and Russia, will discourage the policy changes that would permit permanent resolution of North Korea's chronic food insecurity.

Notes

¹ Some estimates are lower and some are much higher. See Stephan Haggard and Marcus Noland. 2007. *Famine in North Korea: Markets, Aid, and Reform*. Columbia University Press: New York; and Suk Lee. 2011. "Analysis on 2008 Census of North Korea and Problems," Seoul: Korea Development Institute. https://www.kdi.re.kr/kdi_eng/publications/publication_view.jsp?pub_no=12403 Accessed 1 October 2021.

² Stephan Haggard and Marcus Noland. 2017. *Hard Target: Sanctions, Inducements, and the Case of North Korea*. Stanford: Stanford University Press, table 6.2.

³ Heather Smith. 1998. "The Food Economy: Catalyst for Collapse?," In *Economic Integration of the Korean Peninsula*, ed. Marcus Noland, Washington, DC: Institute for International Economics, p.57

⁴ Hazel Smith provides a counterargument that because of its cold climate, caloric intake needs in North Korea are higher than those specified by the UN agencies. Hazel Smith. 2008. "North Korea as the Wicked Witch of the East: Social Science as Fairy Tale." *Asia Policy*. 5 pp. 197–203.

⁵ World Food Programme. "HungerMapLIVE: Global insights and key trends," 11 July 2022 <https://static.hungermapdata.org/insight-reports/latest/global-summary.pdf> accessed 11 July 2022.

⁶ Stephan Haggard and Marcus Noland. 2009. "Famine in North Korea Redux?," *Journal of Asian Economics*, 20(4): 384–395.

⁷ Katsuhisa Furukawa, Veronica Bedenko, Jaewoo Shin, and Xu Tianran. 2021. "Assessment of the Impact of August 2021 Rainfall and Flooding in the DPRK," *One Earth Future*, <https://opennuclear.org/publication/assessment-impact-august-2021-rainfall-and-flooding-dprk> accessed 13 October 2021; Joseph S. Bermudez, Jr., Victor Cha, Andy Dinville, and Jennifer Jun. 2021. "Assessing Fall 2021 Agricultural Conditions in North Korea," <https://beyondparallel.csis.org/assessing-fall-2021-agricultural-conditions-in-north-korea/> accessed 13 October 2021.

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