Food and Agriculture Organization of the United Nations

WFP World Food Programme

DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA (DPRK)

FAO/WFP JOINT RAPID FOOD SECURITY ASSESSMENT

May 2019

Required citation:

FAO and WFP. 2019. FAO/WFP Joint Rapid Food Security Assessment, Democratic People's Republic of Korea. Bangkok. 40 pp. Licence: CC BY-NC-SA 3.0 IGO.

CONTENTS

1. HIGHLIGHTS

- **Prolonged dry spells, abnormally high temperatures and floods, coupled with limited supplies of agricultural inputs, had a severe impact on yields** of the 2018 main crops harvested last September/October.
- **Production prospects for the 2018/19 early season crops – to be harvested in June – are unfavourable** due to widespread low rainfall and lack of snow cover, which left crops exposed to freezing temperatures during winter.
- **Post-harvest losses from harvesting to storage are expected to be higher than usual** as shortages of fuel and electricity hampered the timely transport and processing of crops as well as the ventilation of stocks.
- **The 2018 aggregate food crop production is estimated to be below-average** at 4.9 million mt, 12 percent below the previous year's near-average level and the lowest level since the 2008/09 season.
- Cereal import requirements in the 2018/19 marketing year (November/October) are estimated at 1.59 million mt. With commercial imports officially planned at 200,000 mt and food assistance (already received or pledged) set at about 21,200 mt, **the uncovered deficit for the full marketing year is estimated at an elevated level of about 1.36 million mt.**
- **Food consumption levels are low, and dietary diversity is very poor.** Diets mainly consist of rice, maize or potatoes complimented by kimchi (cabbage), or vegetables and greens when available. Protein intake is very low. Poor food consumption is widespread in the surveyed population in both November (37 percent) and April (46 percent) assessments, and only a few households have an acceptable diet.
- **Food-related coping strategies are widely adopted, including reducing consumption by adults for children to eat and reducing meal sizes.** Urban households who typically rely on relatives in rural areas to access food and diversify their consumption are no longer able to do so to the same extent, as also rural households increasingly face food shortages.
- **Since January 2019, rations of the Public Distribution System (PDS) have been reduced to 300 grams per person per day (g/pp/day),** which compares to 380 grams during the same period in 2018. Rations may decline further during the July to September period, when PDS rations are typically lower compared to other months of the year.
- **Overall, it is estimated that 10.1 million people (40 percent of the population) are food insecure and in urgent need of food assistance**. The situation could further deteriorate during the lean season from May to September, if no proper and urgent humanitarian actions are taken.

2. MISSION OBJECTIVES AND METHODOLOGY

OBJECTIVES

Climate-related shocks combined with political and economic factors in the Democratic People's Republic of Korea (DPRK) have hampered the food security situation in the country for many years. According to the 2018 State of Food Security and Nutrition in the World (SOFI) report, the prevalence of undernourishment stands at 43 percent, resulting in 11 million people in DPRK being undernourished.

At request of the government, a joint FAO/WFP rapid Food Security Assessment Mission (rFSA) visited DPRK from 29 March to 12 April 2019. The overall objective of the joint FAO/WFP Mission was to conduct an independent assessment of the 2018 production shortfall and the food security situation in the country. Provision of accurate, timely and credible information through this exercise is critical to inform appropriate interventions by the government, the international community, and others to mitigate the impact of the reported drops in harvest output.

THE MAIN OBJECTIVES WERE TO:

- Review and verify the 2018 main season crop production and forecast the 2018/19 spring/winter crop production following damage due to erratic precipitation (snow and rainfall);
- Compile the supply/demand balance for main food commodities for the 2018/19 marketing year;
- Assess agricultural input supplies for the 2019 main agricultural season;
- Assess the functioning of food markets, including food availability and price trends; and
- Estimate the number of food insecure people who are in need of food assistance.

METHODOLOGY

The Mission comprised eight FAO and WFP senior agriculture and food security technical experts. A variety of methods were used to triangulate information gathered: a literature and secondary data review[1], field visits, key informant interviews at national and county level, as well as a household survey with PDS dependent and cooperative farmers.

The Mission carried out a retrospective analysis of official production data for the 2018 main harvest, made an early forecast to produce the 2018/19 winter and spring crops, and estimated food crop import requirements for the 2018/19 marketing year (November/October). Satellite-based imagery was used to validate the official information on production of the 2018 main season crops that were harvested at the end of 2018.

Accompanied by experts from the Central Bureau of Statistics (CBS), the Mission, divided into four teams, covered 12 counties in 6 provinces. During the field visit, the Mission met with county-level government representatives and participated in the interviews conducted by CBS staff to assess the food security situation at household level. The Mission also visited cooperative farms, Public Distribution Centres (PDCs), child nurseries, as well state and vegetable shops.

Moreover, 25 additional counties in 9 provinces were covered during the food security assessment conducted by WFP in November 2018.

In both assessments, the visited area was widely diversified in terms of contribution to national food production, as well as the severity of weather shocks experienced during the previous agricultural seasons and general food security conditions. The areas covered both urban and remote rural areas, as well as counties with and without WFP operational presence.

The assessment tools were jointly developed with CBS, and the household questionnaire contained WFP core standard food security indicators. Prior to the field assessment, training sessions were conducted by WFP and FAO with all CBS interviewers on the household survey tool and key informant checklists.

The assessment team drew conclusions from two household assessments, the first conducted in November 2018, where 125 households were interviewed, and the second conducted in April 2019, where an additional 54 households were interviewed using the same survey tool with some slight adjustments. Mission team members were present during household-level interviews as part of both assessments.

Therefore, in total, the analysis included in this report is based on visits to 37 counties and interviews with 179 households (see also Map on page 7).

1 - The Government provided the Mission with the following official data: estimates of areas harvested; yields and production by main food crops at county, provincial and national level; supply of agricultural inputs; livestock numbers; Public Distribution System (PDS) ration levels, and meteorological data. The Mission cross-checked official data against information gathered during interviews with key informants in the capital as well as during the work in the field.

TABLE 1: SURVEYED HOUSEHOLDS BY TYPE

	Number of Households	Number of Counties	PDS Dependent Households	Cooperative Farming Households	Mixed Households
November 2018	125	25	78	37	10
April 2019	54	12	40	14	
TOTAL	179	37	118	51	10

Household selection of both assessments were purposively done by the CBS based on specific criteria agreed beforehand (distribution of PDS-dependent households vs. cooperative farming households, urban/rural distribution, occupation types of household head, etc.). Out of the total sample of 179, 118 households were PDS-dependent and 51 were cooperative farmers. Moreover, 101 households are defined as urban and 79 as rural. Overall, 22 households contained a pregnant or breastfeeding woman. All data were processed and analysed at the CBS with WFP officers present at the CBS premises throughout.

Upon return from the field, the Mission held a technical meeting with officials from the Ministry of Agriculture, the CBS, the Ministry of Land and Environment Protection, the Ministry of Food Procurement and Administration, the Ministry of Commerce and the National Coordinating Committee (NCC) with the aim to gain more in-depth knowledge on specific issues and to request additional information needed.

FAO/WFP assessment team visit to a cooperative farm in Sinchon County, South Hwanghae Province, April 2019.

Prior to departing the country, the Mission briefed the NCC and the CBS on its main findings. Short debriefing meetings were also held with staff of UN agencies, resident NGOs (known locally as EU Project Support Units or EUPS) as part of the Food Security Sector Working Group, and members of the donor and diplomatic community.

LIMITATIONS

The Mission took place outside the pre-harvest/harvest period of the main crop season, therefore the validation of production data could only be made retrospectively, without observing the crop conditions in the field. In addition, there are no official production statistics for sloping land (above 15 degrees), because framing in these areas, besides agro-farming, is officially discouraged by the Government. The Mission was informed that since 2014, the government has initiated a reforestation programme that is resulting in a gradual decline in production from sloping lands.

As described in the methodology section, a purposive sampling methodology was applied by CBS to ensure representation of relevant population groups. This means that findings are indicative of the situation, however, do not provide statistically representative findings at national or sub-national level.

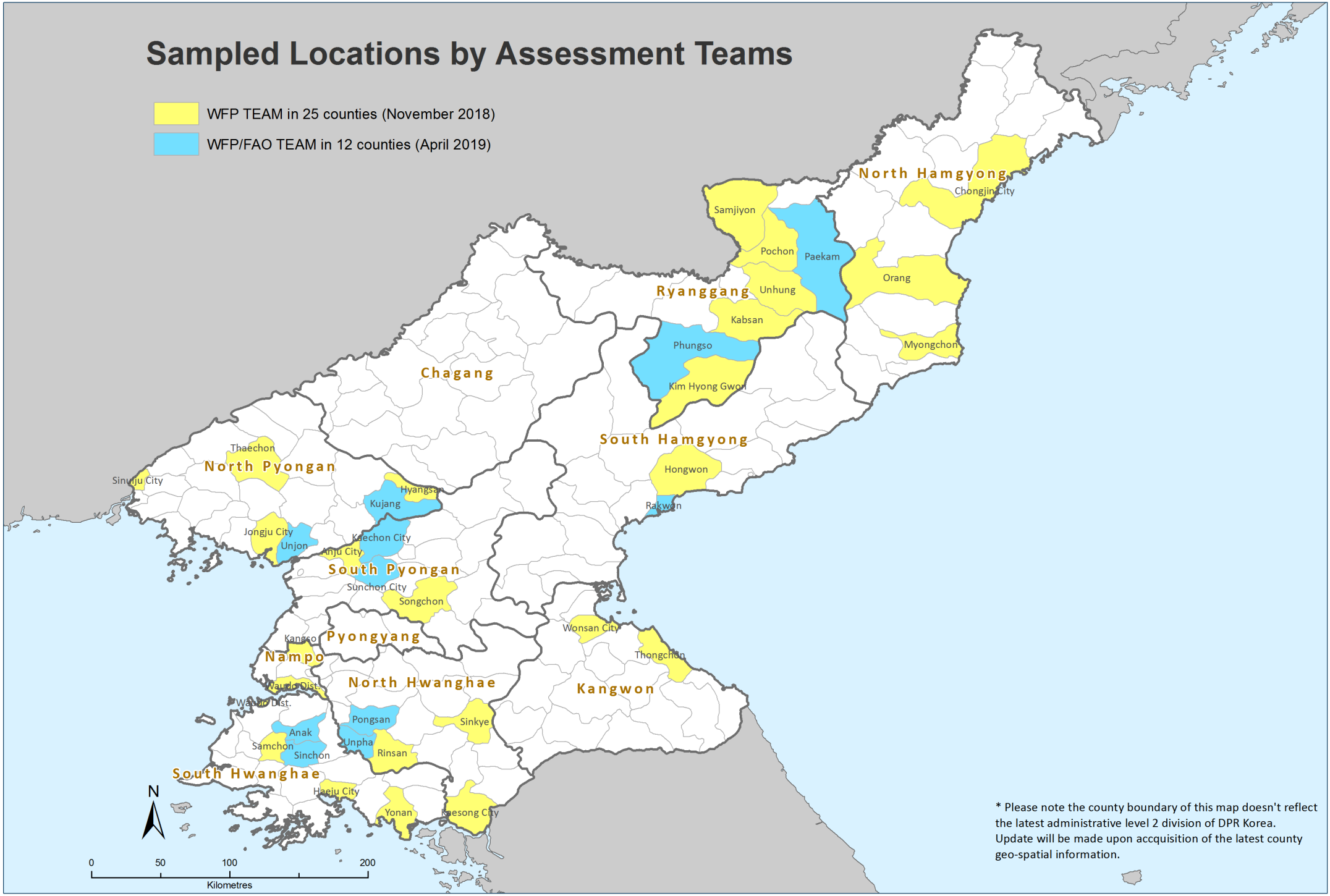
The urban and rural categories applied during this assessment are based on the official consideration of interviewed households and the official statistics. It is worth noting that in DPRK, urban-rural boundaries are not clearly delimited by population or infrastructure densities, but by the administration that controls any given area. If it falls under the "Up" administration, the area is considered an urban area. If it falls under the "Ri", the administration is rural. Many of the "Up" areas covered could be considered as rural in terms of their geographic and livelihoods characteristics. The Mission therefore decided not to present findings by urban and rural in this report.

It is worth noting that all data collected is owned by the Government's CBS, which is also responsible for all data analysis according to national law. Mission members agreed with CBS on the analysis plan in line with the agreement between FAO/WFP and CBS. However, additional analysis beyond the agreed data outputs proved to be challenging to obtain due to time limit.

The Mission was able to visit PDCs, but it was unable to observe direct distributions of rations to PDS-dependent households during the Mission.

The assessment team also experienced challenges in

Sampled Locations by Assessment Teams



* Please note the county boundary of this map doesn't reflect the latest administrative level 2 division of DPR Korea. Update will be made upon accquisition of the latest county geo-spatial information.

Date Created: **18 Apr 2019** - Contact: **ruangdech.poungprom@wfp.org**
Website: **www.wfp.org** - Prepared by: **RBB VAM/GIS**
Map Reference: DRP_counties_visited_2018_2019_v3

FAO/WFP assessment team visit to a cooperative farm in Pongsan County, North Hwanghae Province, April 2019.

accessing markets and acquiring market-related data. However, the team was not able to visit farmers' markets during the field visit. While authorization was granted at national level to visit farmer's markets, county authorities informed that they were not able to receive any foreign delegation on the day. Market visits are highly recommended to fill this information gap in future assessments. Finally, the team could only gather limited information on people's incomes and expenditures[2] during the household surveys.

2 - The November assessment was able to collect 30-day expenditure information from 41 households on food purchased in farmer's markets or through coupons in regulated state shops and some other non-food items. Only preliminary findings are available as data is still being analysed.

SOCIO-ECONOMIC CONTEXT

3. SOCIO-ECONOMIC CONTEXT

TABLE 2: DPRK - KEY ECONOMIC INDICATORS, 2014 - 2018

	2014a	2015a	2016a	2017a	2018b
GDP at market prices (Won bn)	1,717.7b	1,751.3b	1,809.0b	–	–
GDP (US$ bn)	17.4b	16.3b	16.8b	–	–
Real GDP growth (%)	1.0b	-1.1b	3.9b	-3.5b	-1
Exports (US$ m)	4,365	4,150	2,990	1,850	–
Imports (US$ m)	-5,585	-4,820	-3,860	-3,930	–
Trade balance (US$ m)	-1,220	-670	-870	-2,080	–

Source: Economist Intelligence Unit (EUI); a– actual, b-EIU estimates

3.1 MACRO-ECONOMIC SITUATION

DPRK does not officially release economic data and widely varying estimations of macroeconomic numbers exist. Estimations of the Bank of the Republic of Korea suggest that in 2016 the local economy grew at its fastest pace in 17 years, when for the first time, GDP per capita surpassed the US$ 1,000 mark. More recent analyses by the Economist Intelligence Unit (EIU) suggest that the country experienced an economic downturn in 2017 and 2018, amid reduced trade activities as a consequence of sanctions targeting top-earning export sectors, such as coal, minerals and textiles (Table 2).

The primary economic activities in the DPRK are mining, some heavy industry, agriculture and fisheries. The agricultural sector is estimated to contribute to roughly one quarter of the country's GDP, with significant fluctuations over the years due to frequent climatic shocks impacting agricultural production.

3.2 AGRICULTURAL SECTOR

The geography of the country is largely mountainous, with only 15 percent of the land (or 1.9 million ha) suitable for agriculture. Of this, about 30 percent is irrigated, mostly paddy fields and winter/spring crops. The most productive agricultural land is located in the western plains of the country, and narrow strips along the east coast. Rice, maize and potatoes constitute the major food crops, with the first two commodities contributing 45 and 34 percent of overall grain production respectively. However, the proportion of each crop produced and consumed in local diets varies greatly in different parts of the country. Soybean, barley and wheat are also widely cultivated as well as minor grains such as millet, sorghum, oats and rye.

The organization of the rural economy is mostly characterized by the operation of cooperative farms, with a smaller number of state farms. According to the CBS, the farming population involves 2,513 cooperative farms with 2.54 million farmers and 707 state farms, employing 802,000 farmers. State farms tend to be specialized in large -scale production of livestock, fruits, vegetables and other cash crops. By contrast, cooperative farms are responsible for producing most of the grains and staple foods. They also produce vegetables, fruits and livestock, which are sold into the government marketing system and distributed to cooperative farm members.

Cooperative farmers prepare the land for planting of rice crop in Anak County, South Hwanghae Province, April 2019.

Cultivated lands with slopes below 15 degrees are managed by cooperative farms, while lands above 15 degrees of slope are officially administered by the Ministry of Land and Environmental Protection (MoLEP). Sloping lands are also used by households, both from cooperative farms and from urban areas, to grow maize, soybean, vegetables and other crops for their own consumption. This practice dates back to the late 1990's when, due to the general shortages of food, land use regulations were relaxed and households expanded cultivation onto sloping lands. In 2014, however, the government initiated a reforestation programme that is resulting in a gradual decline in production from sloping lands.

The government sets annual production targets for cooperative farms. At harvest, a part of staple food is allocated to farmers for their consumption, and anything in excess of this is sold to government agencies at centrally-determined prices. Other production such as vegetables and livestock beyond the targets can be made use of through sale or barter. The government is also responsible for providing agricultural inputs to cooperative farms based on a national planning system. These inputs are also provided at centrally-determined prices. Monetary transactions are made through bank transfers, as the banking system seems to be reliable, as per the key informant meetings at county level.

Cooperative farm members earn work points for their labour and, following the harvest at the end of a year, receive their grain allocations based on the work points earned during the year. The national average is set at 600g/pp/day. Kitchen gardens play an important role in food consumption, and are relatively common among cooperative farmers and rural PDS-dependent households. On average, kitchen gardens are 30 pyong (approximately 100 m^2), but the size varies between farms and across different parts of the country (i.e. bigger in Ryanggang than in southern provinces). These gardens provide an important source of dietary diversity for cooperative farm members and generate a surplus that can be bartered or sold.

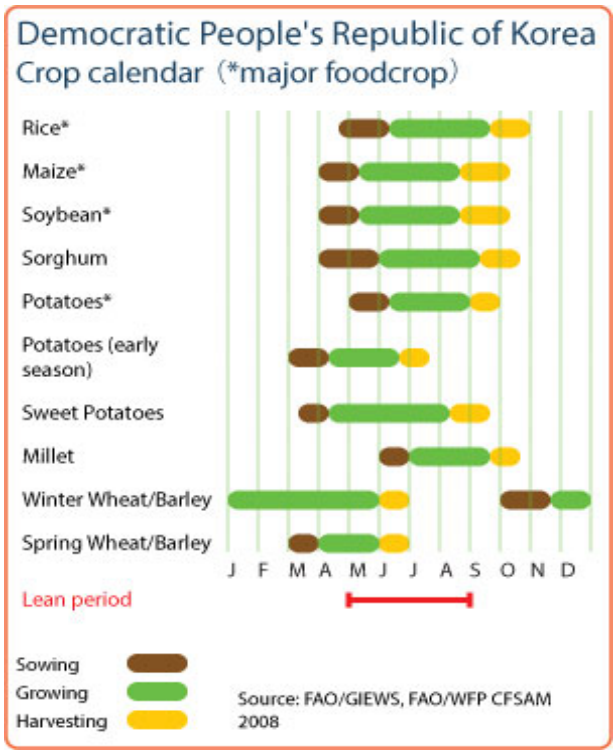
The principal objective of the five-year strategy for national economic development (2016-2020) is to stimulate agricultural production. Specifically, the strategy aims to promote the adoption and use of high-yielding seed varieties and advanced crop cultivation and management techniques, which is foreseen to assist in increasing production of cereals, fruits and vegetables. In addition, the strategy aims to address areas that have impeded livestock production, and therefore supports the establishment of joint stockbreeding by cooperative farms and sideline stockbreeding by individual farmers, with the intention to improve the supply of meat and eggs for households. Regarding the fisheries and aquaculture sector, the strategy targets the upgrading of fishing boats and the expansion of offshore and cage-net fish farming, focusing on the promotion of offshore cultivation of shellfish and seaweed.

CROPS

The main agricultural season starts in April, with the arrival of the spring rains, and the harvest normally takes place between September and October (Figure 1). Low temperatures at the beginning of the season mean that farmers need to considerably raise seedlings for rice and maize in protected beds for subsequent transplanting when field conditions become suitable. The availability of water for irrigation is critical in determining the main season output, particularly in the case of paddy crops. Paddy and maize are predominantly grown in the southern and central provinces of the country (Figure 2). Early season crops, including winter wheat and barley sown in October/November, are harvested between June and early July, depending on the geographic location within the country. Areas planted with wheat and barley crops have declined since 2003 and have gradually been replaced mostly by early season potatoes. Despite a small output compared to the main crops (they make up 8 percent of total production), the early crops play an important role for food security as they contribute to mitigating the food gaps and high prices for other staples during the lean season.

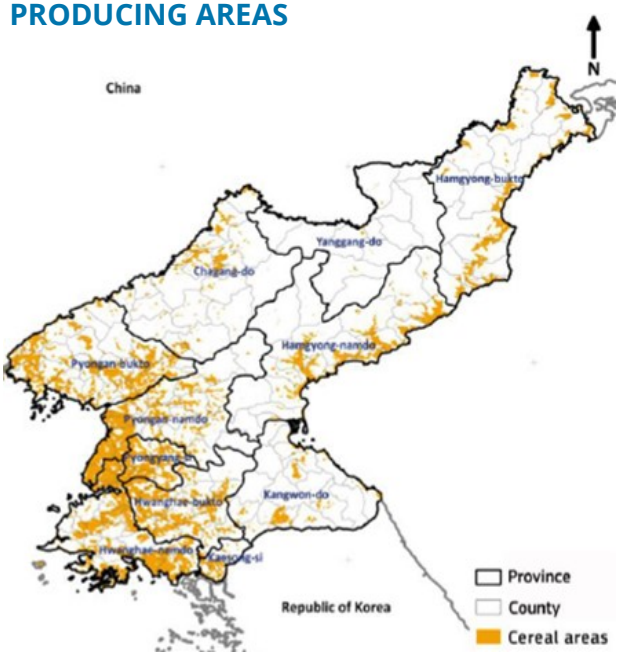
FAO/WFP Mission teams observing early season crops in Unpha County, North Hwanghae Province, April 2019.

FIGURE 1: DPRK - CROP CALENDAR



Source: FAO/GIEWS

FIGURE 2: DPRK - MAIN CROP PRODUCING AREAS



Source: European Commission's Joint Research Centre (JRC).

Given the limited amount of arable land, the short growing seasons and the recurrent climatic hazards (that are expected to become more frequent and intense due to the effects of global warming), the production of an adequate amount of food is a perennial challenge in DPRK. Annual shortfalls over the past decade range between 400,000 mt and one million mt. Several strategies are being pursued to increase production, including the introduction of improved seeds and improved varieties, improving soil health and fertility, and integrating crop and livestock production.

One important element for achieving food security involves expanding the area under double cropping as broadly as possible through practices such as using greenhouses to produce seedlings for transplanting to open fields, using tunnel houses and plastic mulch to preserve soil moisture, and the introduction of short-season and cold-tolerant varieties that can extend the growing season. Efforts to expand the area under double cropping are hindered when inputs, such as seeds and fertilizers, are received late or when there is insufficient labour to plant at the earliest opportunity, or to bring the first crop in from the fields in time to get the second crop planted and in the ground. The speed with which farming operations can be completed has important implications for the opportunity to expand double cropping. Delays in planting or harvesting operations can result in the loss of critical days that are necessary for successful double cropping during the short growing season.

VEGETABLES

The availability of vegetables in the winter months is very limited. Traditionally in October/November both urban and rural households use cabbage to make kimchi as their main source of vegetables until the following March/April. Some rural households reported that in winter and spring their diets largely consist of kimchi, salted pepper or dried radish leaves with rice or potatoes. Increased vegetable production offers an important opportunity to improve the nutrition and health of the population and is especially important for providing essential vitamins and minerals for pregnant and breastfeeding women, and the young. Vegetables are produced both by cooperative and state farms, as well as by households using their kitchen gardens. In some urban areas, residents are also often allocated a small plot of land for their own use to grow vegetables. Households growing vegetables reported using their own seeds retained from the previous season for vegetables.

Assessing the national gap in vegetable production is complicated by the fact that statistics include only vegetable production by cooperative and state farms and do not include production from household gardens. Assuming average productivity of 15 mt/hectare from an area of 30,000 hectare on cooperatives and state farms, vegetable production could be estimated at about 0.45

TABLE 3: DPRK - LIVESTOCK POPULATION 2015-2017 (000 HEADS)

	Cow	Pig	Goat	Rabbit	Chicken	Duck	Geese
2015	576	2,412	3,685	32,139	15,452	6,988	2,133
2016	576	2,582	3,682	31,819	15,322	6,825	2,134
2017	576	2,601	3,684	32,009	15,393	6,932	2,135
2017 change from 2015 (%)	-0.02	7.82	-0.03	-0.4	-0.38	-0.79	0.1

Source: CBS.

million mt. This compares to a requirement of 2.7 million mt based on a recommended minimum consumption of 300 g/pp/day, suggesting a gap of vegetables as high as 2 million mt. Some of this shortfall is obviously made up through production on kitchen gardens, but the need for expanding vegetable production is clear.

LIVESTOCK

Animal-sourced food is important for adding protein, minerals and vitamins to diets and increasing dietary diversity. Increasing the availability of animal-sourced food can contribute significantly to improving food and nutrition security, particularly for segments of the population considered most vulnerable. The national five-year development plan calls for an increase in livestock production and the government is encouraging the establishment of joint stockbreeding by cooperative farms and the side-line stockbreeding by individual farmers, with the aim to supply households with more meat and eggs. Nevertheless, national level data shows minimal change to the overall number of livestock between 2015 and 2017, with the exception of pigs, which increased by about 8 percent from 2.41 million head in 2015 to 2.6 million head by 2017 (Table 3).

Government data on livestock numbers includes only animals raised by cooperative and state farms and does not include those raised by households. Many cooperative households use their kitchen gardens to raise small livestock, such as poultry, pigs, goats and rabbits for their own consumption, and for barter or sale. Some families classified as urban and PDS-dependent also raise small livestock. Opportunities for increasing livestock production can be found through integrated crop/livestock production models involving fodder crops and crop residue for feed and using manure to improve soil fertility and soil structure.

However, the livestock sector is highly vulnerable to outbreaks of contagious diseases which can spread quickly and widely, decimating livestock populations and further endangering food security. The capacity to detect and control diseases is very weak due to a shortage of testing equipment and supplies. In addition to diseases affecting poultry and rabbits, Foot and Mouth Disease poses a threat to swine, sheep, goats and cattle. The highly contagious African Swine Fever, for which there is no cure or vaccine, is considered a high risk as it has already been found in neighbouring provinces of China.

There is also potential to increase fish production and improve the availability of nutritious food using fish ponds and caged fish farming on lakes and reservoirs.

ENVIRONMENT AND LAND DEGRADATION

Since the early 1990s, afforestation and forest conservation have been promoted actively. However, as reported in the DPRK National Agroforestry Strategy and Action Plan 2015–2024, forests have been massively damaged and degraded due to the temporary economic difficulties and consecutive natural disasters in the mid-1990s. During this period, the country faced economic difficulties and became increasingly dependent on forest resources, which led to excessive deforestation for timber, non-timber forest resources and firewood collection which is largely used for cooking and heating at household level.

To make matters worse, repeated natural disasters resulted in increased cutting of timber required for rehabilitation works. Tens of thousands of hectares of forest lands were cleared to produce food, damaging degraded forests completely. Slash-and-burn farming practices have become causes of forest fire, accelerating deforestation and forest degradation. Since late 1990s, the number of forest fires and the damaged area increased rapidly. The area damaged by forest fires from 1995 to 2014 reached tens of thousands of hectares. Deforestation and forest degradation reduced forest health and increased pest breakouts, in particular pine caterpillar.

Forest depletion and degradation and the loss of forest cover has resulted in reduced water infiltration, increased soil erosion and landslides, and contributed to the sedimentation of rivers. Serious sedimentation also happened in lakes and reservoirs, remarkably reducing water storage capacity. Rivers and streams dried up, causing severe drought damage.

Cooperative farmer in kitchen garden in Anak County, South Hwanghae Province, April 2019.

Frequent floods and droughts reduced the regeneration capacity of forests and inflicted huge damage to agricultural production, industrial facilities, people's lives, and properties. The degradation of agricultural land occurs also due to construction of reservoirs, roads and river dykes. The country has no traditional rangelands, but some forest lands has been converted to grazing lands totalling up to about 200,000 ha. However, the lack of sustainable grazing methods and practices eventually leads (to some extend) to the decline of ecological carrying capacity of rangelands. Climate change and variability, and the increasing frequency and intensity of extreme weather events in the recent years have made the above situation even more acute.

UNINTENDED IMPACT OF SANCTIONS ON AGRICULTURAL PRODUCTION

The sanctions imposed on the country by the United Nations Security Council (UNSC) in December 2017 were the strictest yet. The text of the resolution states that sanctions "are not intended to have adverse humanitarian consequences for the civilian population of the DPRK". Nevertheless, the unintended negative impact sanctions can have on agricultural production, through both direct and indirect impacts, cannot be ignored. The most obvious are restrictions on the importation of certain items that are necessary for agricultural production, in particular fuel, fertilizers (nitrogen and phosphate), machinery and spare parts for equipment.

In 1991, the country's oil consumption amounted to 3.8 million mt/year, subsequently falling to 750,000 mt by 2017. According to data received from CBS, the national allocation of fuel for agriculture in 2018 was 44,502 mt, including 40,502 mt of diesel and 4,000 mt of petrol. Given an average annual amount of 1.4 million hectares cultivated between 2012 and 2018, this amounts to 31 kg of diesel fuel per hectare. Shortages of fuel, electricity and pumping equipment limit the ability to irrigate, reducing yields and making crops susceptible to extreme weather shocks, such as drought and heatwaves.

There is a starkly diminished level of agricultural mechanization in the country as machinery ages, spare and replacement parts are unavailable, and fuel is in short supply. Delays are experienced in agricultural operations because manual labour and animals substitute for mechanized operations. These delays in turn limit the possibilities for increasing the area under double cropping, while at the same time increasing post-harvest losses. The deterioration of infrastructure, reduction in electricity supply and wearing out of machinery and equipment undoubtedly results in the levels of post-harvest losses increasing year after year.

Most cooperative farms are equipped with stationary threshers, large machines permanently fixed in one place for threshing rice or wheat. Grain cut in the fields, including straw, is carried to the threshing site. Without enough tractors, the transport of the grain and straw from the fields to the threshing site is done using ox-carts that can carry a maximum of 250 kg in one load. The need to transport grain from the field to the threshing floor results in delays, sometimes of several weeks, during which the grain could deteriorate from being exposed to the different factors. In particular, rains, rodents and pests during this period can lead to larger losses.

Equipping cooperatives with mobile threshers that can be taken out to the fields, overcoming the need to carry grain and straw to a central location, would significantly reduce the time needed to thresh the harvest. Moreover, only the threshed grain would have to be transported to storage, leaving the straw and residue in the fields. It is estimated that mobile threshing machines could reduce post-harvest losses by up to 10 percent.

Once the grain is threshed, it has to be dried to a maximum moisture content of 14 percent before being moved to storage. Electricity is the most common energy source for grain driers. Lack of energy can result in grain with high moisture content going into storage, making it susceptible to spoilage or the occurrence of mould, fungus and mycotoxins. In the absence of grain driers or with a shortage of electricity, the common practice is to dry grain

by spreading it on the open ground, but this practice leaves grains susceptible to damage in case of rain or cool temperatures. Storage of crops in facilities lacking proper ventilation, temperature and humidity control can further add to post-harvest losses. Potatoes are particularly sensitive to humidity and temperature, and post-harvest losses of potatoes in storage areas are reportedly as high as 20 percent. Improving storage facilities for potatoes could be done by providing wooden pallets and plastic to keep potato storage areas dry and improving ventilation.

Processing products into items like biscuits, bean paste or starch noodles can increase storage life and improve food availability during the lean season months prior to the annual harvest. However, facilities for food processing also remain idle due to the shortage of electricity as well as deteriorating equipment and a lack of spare parts.

LOSSES AT HOUSEHOLD LEVEL

While PDS-dependent households reportedly receive their allocations of staple food twice a month, households on cooperative farms reportedly receive their allocations of grain and staples in two distributions after the harvest (where two growing seasons take place) and one single distribution in areas with just one cropping season.

In the potato growing region such as Ryanggang Province, families may receive two mt of potatoes or more at distribution and be responsible for storing them until the food distribution in the following year. Storage at a household level in rudimentary facilities undoubtedly results in a high degree of household waste. Interviews with households suggested higher losses at farms' level as compared to PDS households due to larger quantities to be stored and poor storage facility.

FOOD PRODUCTION IN 2018