



GLOBAL INFORMATION AND EARLY WARNING SYSTEM ON  
FOOD AND AGRICULTURE (GIEWS)

SPECIAL ALERT

No. 340

COUNTRY: The Democratic People's Republic of Korea

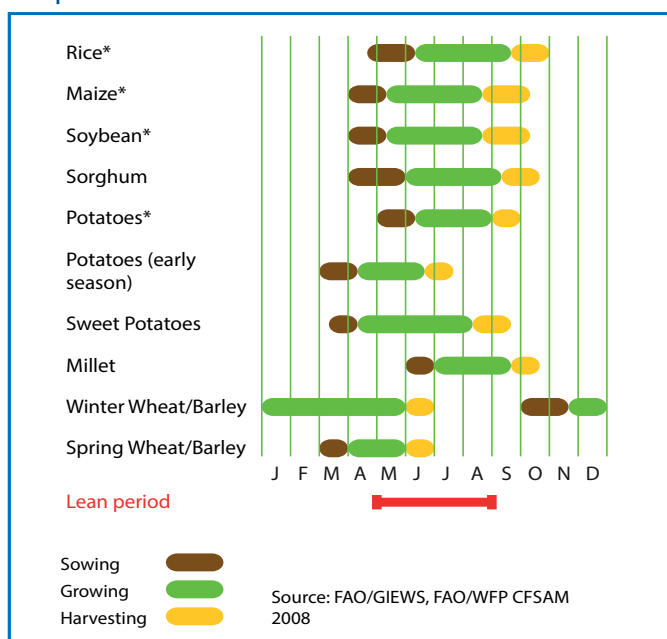
DATE: 20 July 2017

Prolonged dry weather threatens the 2017 main season  
food crop production

Highlights

- Prolonged dry weather conditions from April to late June in the main central and southern cereal-producing provinces raise serious concerns about the final production of the ongoing 2017 main cropping season.
- If rains do not improve soon, the 2017 cereal output may decrease significantly, further worsening the local food security situation.
- Immediate interventions are needed to support the affected farmers and prevent negative coping strategies for the most vulnerable households.

Figure 1: Democratic People's Republic of Korea -  
Crop calendar



\*major foodcrop

A severe dry spell from April to June has acutely constrained planting activities for the 2017 main season and adversely affected yield potential of the early-planted crops. Rainfall volumes from April to June (a critical period for crop development) in key-producing areas were well below the Long-Term Average (LTA)<sup>1</sup> and lower than the rainfall levels of the corresponding period in 2001, when cereal production in the country decreased to the unprecedented level of around 2 million tonnes (rice in paddy terms), causing a sharp increase of food insecurity levels. Although some rains in the first dekad of July over most of the growing areas provided some relief, they were likely to be too late to allow normal planting and development of the crops.

<sup>1</sup> The LTA is calculated from 1989 to 2012.

Report prepared in collaboration  
with the Joint Research Centre of the  
European Commission



More rains are urgently needed to avoid significant decreases in the main 2017 cereal production season. Should drought conditions persist, the food security situation is likely to further deteriorate. The FAO will continue to closely monitor the weather conditions and the development of the 2017 main season crops.

The food supply and demand situation for the 2016/17 marketing year (concerning the 2016 main season crops harvested in September and October 2016 and 2016/17 early season crops harvested by June 2017) is described after discussing prospects for the 2017 main season production and needs assistance.

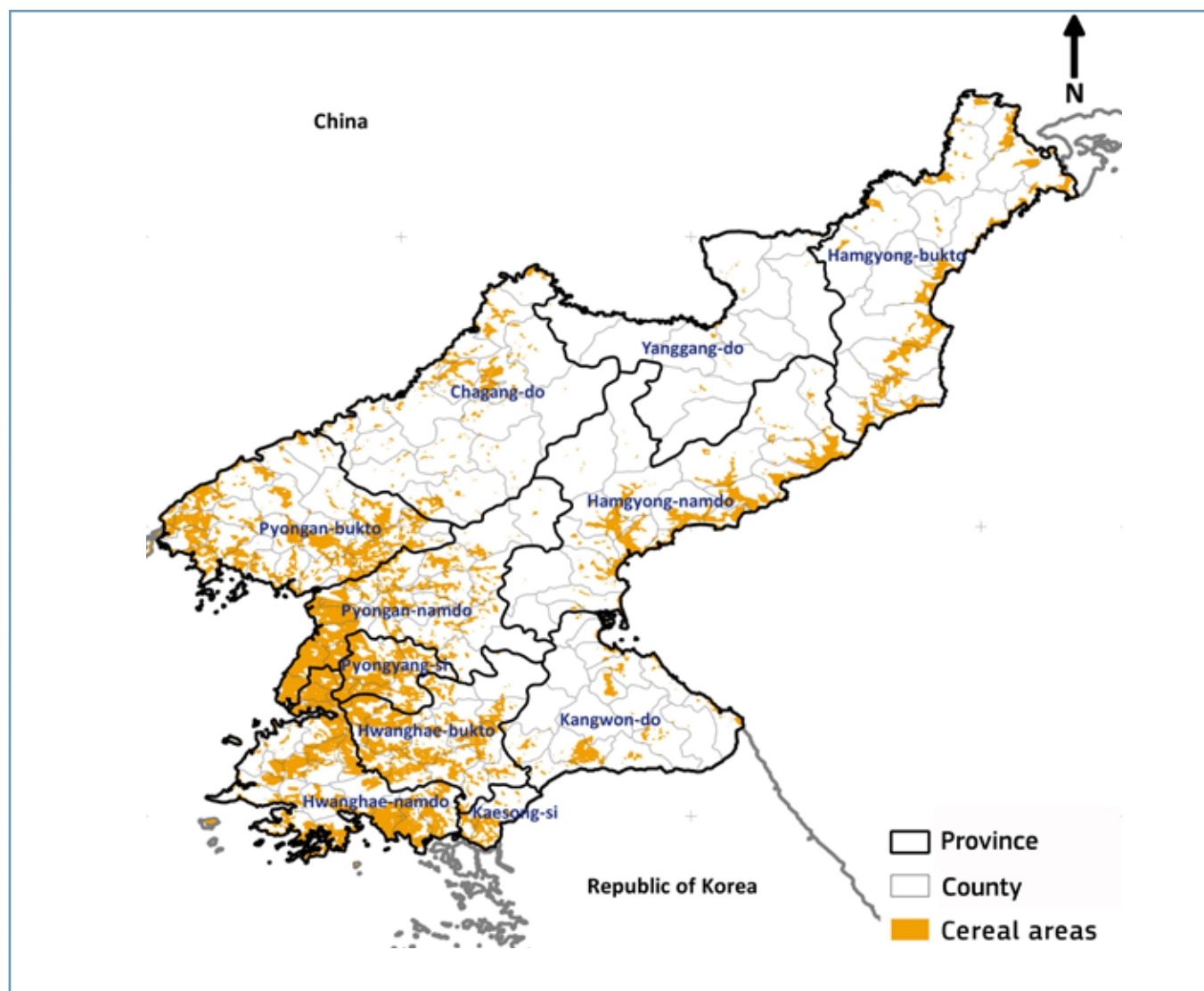
### Unfavourable prospects for 2017 food production

An analysis by the European Commission's Joint Research Centre (JRC) indicates that rainfall from the beginning of April until the end of June was well below average

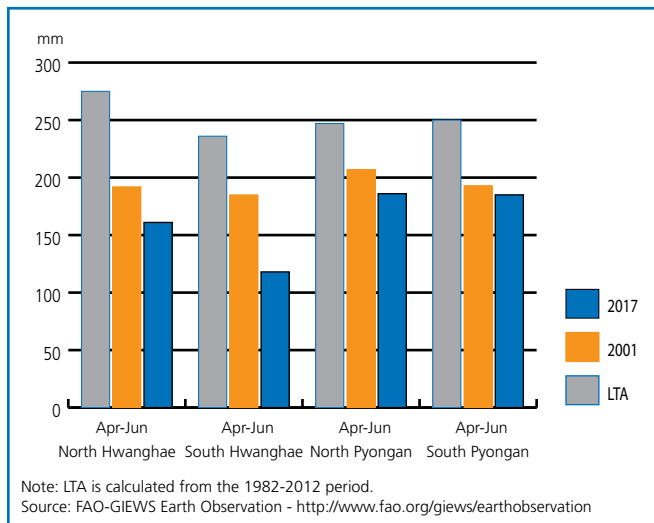
for much of the country. This, coupled with reduced water supplies for irrigation, due to precipitation deficits and the unusually high temperatures from the 2016/17 winter months to June, hindered the sowing process of the 2017 staple rice and maize crops, and adversely affected the yield potential of early-planted crops, including potatoes and soybeans. The impact of the dry spell on crop and vegetation growth is captured by a vegetation index derived from satellite imagery. Negative anomalies of the vegetation index were particularly visible from April to June in the main cereal-producing areas, including the provinces of South and North Pyongan, South and North Hwanghae and Nampo City (see Figure 2), which collectively normally account for close to two-thirds of the overall main cereal production season.

In these provinces, total rainfall volumes from April to June were between 25 percent and 50 percent below

Figure 2: Democratic People's Republic of Korea - Main cereal areas



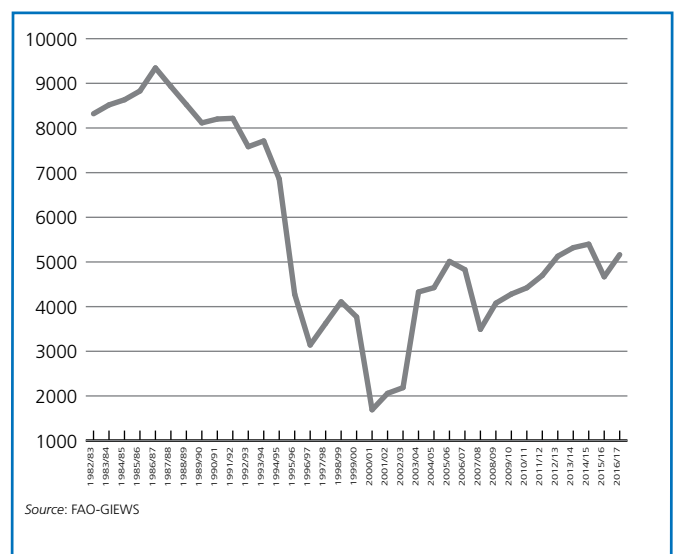
**Figure 3: Democratic People's Republic of Korea - Estimated seasonal cumulative rainfall between April and June 2017 compared with 2001 and LTA in the main cereal-producing areas**



the LTA and considerably lower than the rainfall levels of the corresponding period in 2001 (see Figures 3 and 5), when cereal production in the country decreased to the unprecedented level of around 2 million tonnes (see Figure 4). Although a detailed assessment of the crop damage is not yet available, early official estimates, provided by the National Coordinating Committee (NCC) on 23 June, indicate that about 50 000 hectares of cropland have been severely affected by the prolonged dry spell. This includes about 30 000 hectares of paddy fields and over 20 000 hectares of maize. Although the early estimate of the drought-affected area amounts to only 5 percent of the total national planted area for the main paddy and maize season, these figures are likely to increase significantly if rains do not improve in the forthcoming two weeks. Other 2017 main season crops, including spring potatoes and soybeans, are also expected to be adversely affected by the ongoing drought. According to information from field visits to South Hwanghae Province on 27 June, undertaken by international organizations, including UN Agencies, the European Union, international cooperation agencies and Non-Governmental Organizations, the impact of the drought on crops was evident and widespread throughout all the areas visited. In addition, reports from the field also indicate that wells, canals and

streams, as well as water levels in reservoirs, were visibly depleted. The unusually low rainfall resulted in poor pasture conditions negatively affecting livestock. In the areas most affected by drought, it is estimated that around 20 percent of the herds, including cattle, pigs, sheep, goats and poultry, have been severely affected. The prolonged dry spell has also seriously affected the maturing process of the 2016/17 early season crops (some winter/spring wheat and barley and the main potato crops), harvested in June. Severe water deficits at the critical period of grain filling (April-May) have negatively affected yields. No precise information on the full extent of the damage is yet available. Pending a more detailed official assessment, the FAO has considerably lowered the 2016/17 early season (winter and spring) crop production forecast to take into account the losses due to prolonged drought. As a result, the 2016/17 early season (winter and spring) crop production levels are now estimated by the FAO at 310 000 tonnes (cereal equivalent), down from the official forecast at the start of the season of about 368 000 tonnes.

**Figure 4: Democratic People's Republic of Korea - Total cereal production ('000 tonnes)**



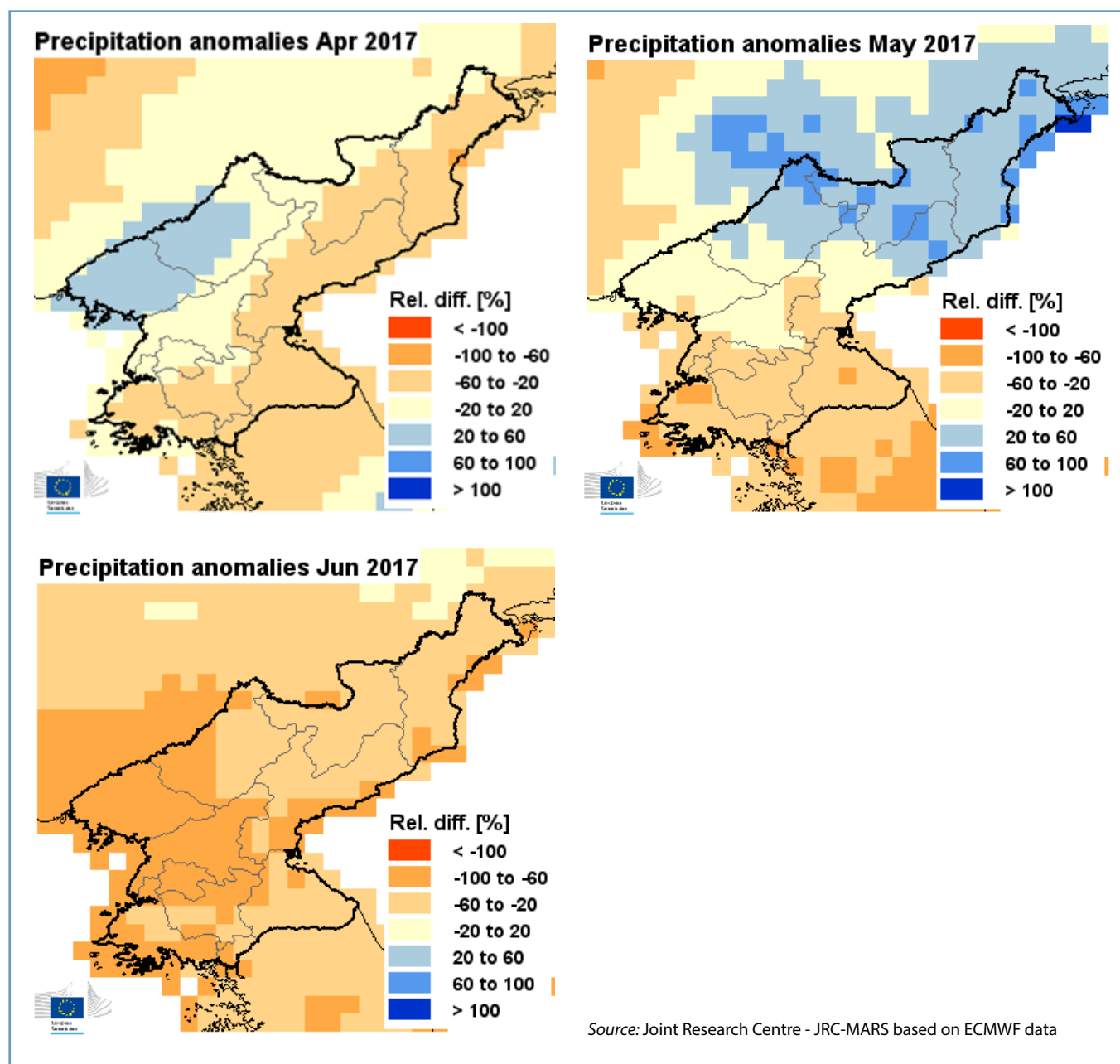
### Food security concerns for large numbers of people

The Public Distribution System (PDS)<sup>2</sup> remains the main source of food for around 18 million people, 70 percent of the total population. Given the

<sup>2</sup> **Public Distribution System (PDS)**, used as a Government-managed system for food distribution, was established in the Democratic People's Republic of Korea in 1946. This centrally-controlled system is based on national production estimates and planned food imports. The Food Procurement and Administration Ministry determines ration sizes for cereals, cooking oil and pulses, and allocates the rations to the entire population. There are two consumer groups for the PDS: cooperative farmers (30 percent) and dependents (70 percent).

**Figure 5: Democratic People's Republic of Korea - Precipitation anomalies from April to June 2017**

Calculated from the rainfall estimates by the European Centre for Medium-Range Weather Forecasts (ECMWF)



dependence on national cereal production, the drop in the 2016/17 early season output worsened the food insecurity for a large proportion of the population. Although the early season harvest is relatively small, accounting for about 10 percent of the total annual cereal production, these crops are an important source of food during the lean season, which lasts from May to September. With expectations of reduced production of the main 2017 season crop, the food security situation is likely to deteriorate in the 2017/18 marketing year.

### Immediate assistance

Most of the country's population is critically dependent on agriculture for their livelihoods. At this point, it is vital that farmers receive appropriate and timely agricultural input assistance, including irrigation equipment, such as water pumps and sprinklers to safeguard the planted fields of the main 2017 crop season. It is also recommended to start as soon as possible with the rehabilitation and upgrade of irrigation schemes. This will minimize losses of water, increasing timely water availability. Increased

food imports, commercial and/or through food aid, would be required during the next three lean months (July to September) until the harvest of the 2017 main season from the end of September to October, in order to ensure adequate food consumption for the most vulnerable people.

### Long-term assistance

Recognizing the increasing frequency of natural disasters that affect the agricultural sector and its impact on food security, it is recommended to introduce longer-term measures to increase farm and household resilience to natural disasters and climate change, such as the promotion of drought-tolerant crops and varieties, the rehabilitation and upgrading of irrigation schemes, and livelihood diversification.

### Food Supply and Demand Situation in 2016/17 (November/October)

This part of the report describes the food supply and demand situation (concerning crops harvested by June 2017).

### Cropping season overview

The main agriculture season starts in April with the arrival of the spring rains, and crops are normally harvested during September and October. The low temperatures at the beginning of the season emphasize the need to raise seedlings, to a large extent, in protected beds for subsequent transplanting once field conditions are suitable. The availability of water for irrigation is critical in determining the main season output, particularly for the predominantly irrigated paddy crop. Paddy and maize are the major main season crops and the country's most important staple foods. The bulk of the paddy and maize production is concentrated in southern and central-producing provinces, including South and North Pyongan and South and North Hwanghae, which together account for around two-thirds of the annual food production. There is also an early season, with winter wheat and barley sown in October-November as well as spring wheat, barley and potatoes sown in March-April, depending on the geographic location within the country. The importance of wheat and barley cultivation has declined since 2003, and both crops are being replaced by early potatoes.

### Climatic conditions in 2016/17

Analysis by the JRC indicates that rainfall during the 2016 main season from April to October 2016 was mixed. Rainfall from mid-April through June 2016, the normal planting period of the main cereal crops season, was average or slightly above average throughout most of the country. However, these rains failed to improve irrigation water availability, which remained close to the low level of 2015. This hindered sowing operations of the 2016 main paddy crops season, with the area planted remaining close to 2015's low level. The months of July and August are usually the wettest in the country, accounting for more than half of the total annual precipitation. In 2016, July and August were characterized by drier-than-usual weather conditions in southern and central "food basket" provinces, which had a negative impact on yields of the main season crops, such as paddy, maize, potatoes and other cereals. A period of excessive precipitation in late August in northeastern parts of the country triggered localized flooding in the North Hamgyong Province along the Tuman River and its tributaries, affecting a large number of people and causing severe damage to housing, infrastructure and the agricultural sector. The rains during the month of September were near average in most of the country, except the main cereal-producing provinces of North and South Hwanghae, where amounts were below average (see Figure 6) affecting standing crops (see Figure 7). Recurrent periods of below-average rains between October and March reduced the area planted with the 2016/17 early season crops (minor winter/spring wheat and barley and main potato crops), harvested in June 2017. In addition, the poor rains between April and late June 2017, resulted in water deficits at the critical period of grain filling (April-May) and negatively affected the yields of these crops.

### Inputs in 2016

**Farm power:** Previous reports indicate that the scarce availability of machinery and fuel has been the most important factor in keeping local crop production at low levels. Although data from the NCC show an increase in diesel and petrol consumption in 2016 over the reduced level of 2015, official estimates indicate that mechanized land preparation could only be carried out on about 60 percent of the arable area, with the remaining land being prepared by oxen.



Figure 6: Democratic People's Republic of Korea - Precipitation anomalies from April to September 2016  
Calculated from satellite imagery (METOP-AVHRR)

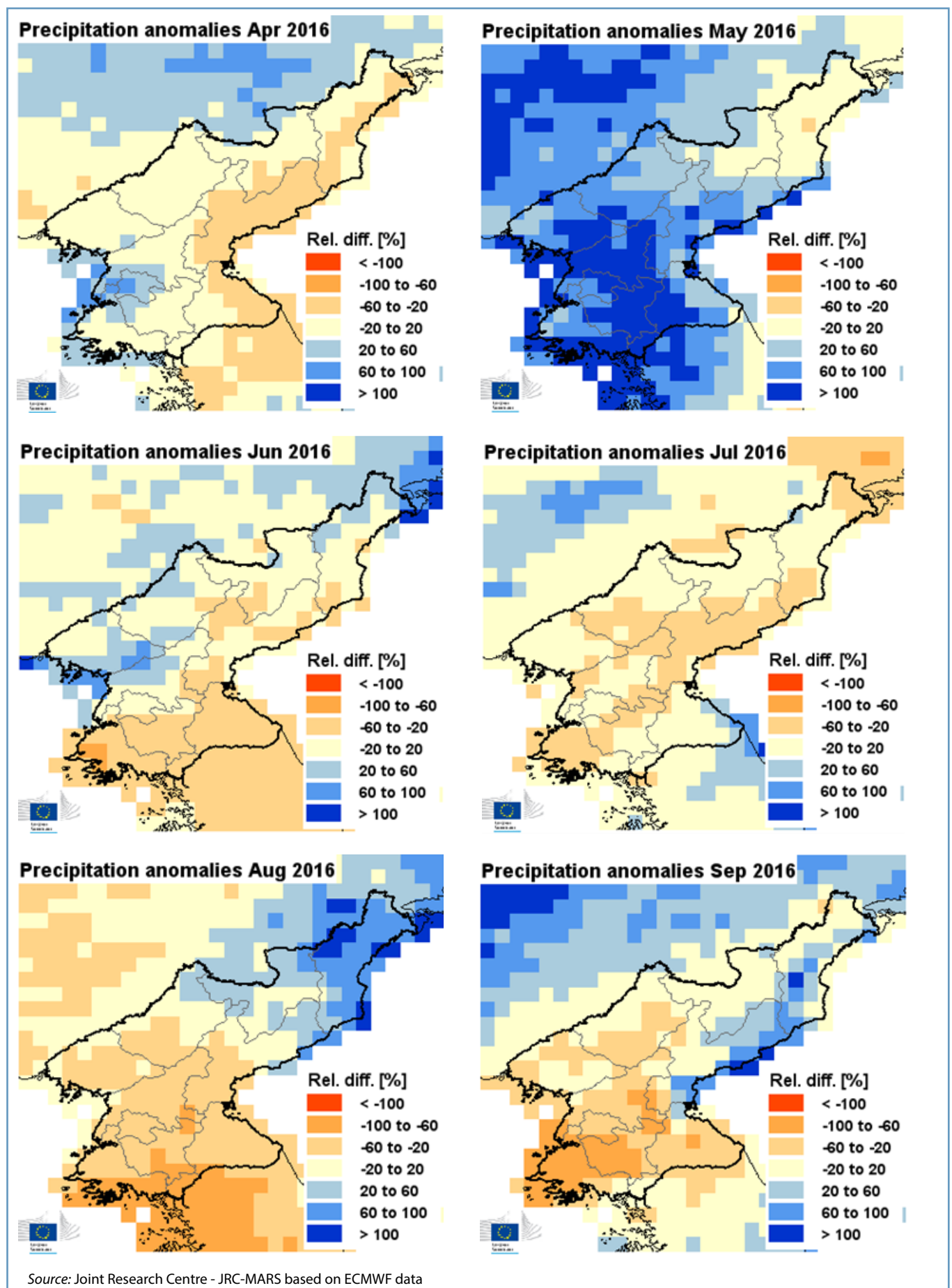
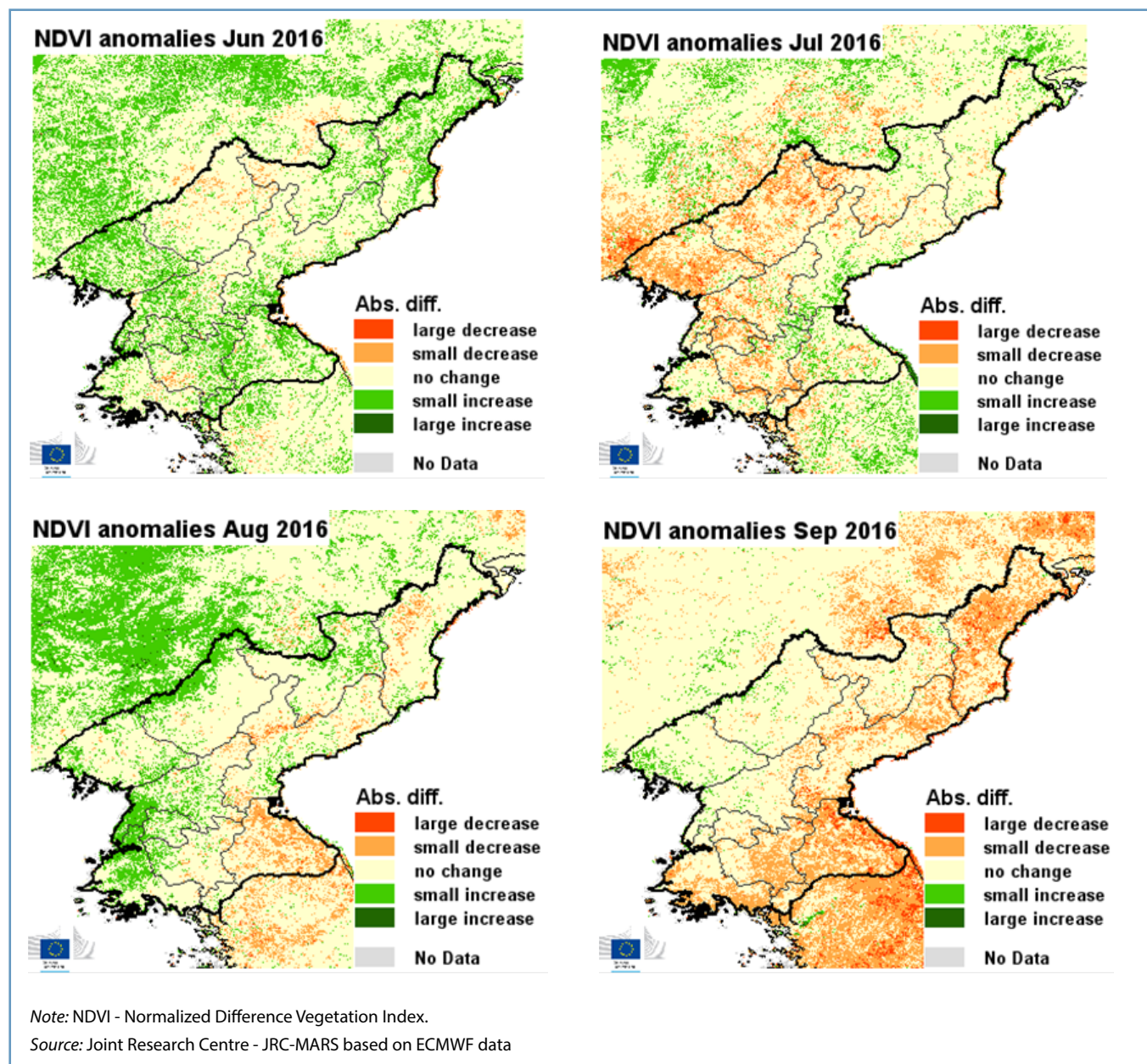


Figure 7: Democratic People's Republic of Korea - NDVI anomalies from June to September 2016

Calculated from satellite imagery (METOP-AVHRR)



**Irrigation:** Reduced precipitation and unusually high temperatures from the 2016/17 winter months to June resulted in low levels of water supplies for irrigation. According to the Ministry of Agriculture, water availability in irrigation reservoirs during the 2016 main season was close to the previous year's low level, and 40 percent below the normal levels (see Table 1).

**Table 1: Democratic People's Republic of Korea - Volume of water in irrigation reservoirs, 2012-2016 (10 million m3)**

Year	Target	Actual
2012	357	375
2013	357	364
2014	240	100
2015	245	233
2016	235	223

Source: Ministry of Agriculture (MoA)

**Fertilizers:** During 2016, the total supply of nitrogenous fertilizer, phosphate and potash is reported to have increased considerably over last year's low level to 850 000 tonnes (see Table 2).

**Table 2: Democratic People's Republic of Korea - Fertilizer statistics for 2009-2016 (tonnes)**

Year	N (ammonium sulphate equivalent, approx. 20.5 % N)	P (superphosphate equivalent, approx. 17% P2O5)	K (KCl-muriate of potash, 48-62%K2O)	Total
2009	434 807	2 776	8 400	445 983
2010	475 100	11 402	12 314	498 816
2011	735 943	5 545	4 477	745 965
2012	686 517	21 460	18 650	726 627
2013	686 015	18 396	2 788	707 199
2014	727 993	18 977	2 700	749 670
2015	612 194	7 817	2 595	622 606
2016	837 171	11 911	930	850 012

Source: Ministry of Agriculture (MoA)

## Cereal production in 2016/17

**Area planted:** The aggregate 2016/17 food crop planted area is estimated at 2 million hectares, almost 2 percent above the 2015/16 level (see Table 3). This figure includes the official estimates by the MoA for the 2016 main season crops and forecasts by the FAO for the 2016/17 early season (winter/spring) crops. Based on the previous estimates by the FAO, some 550 000

hectares of sloping land have been added. Much of the country's sloping land has been cultivated for decades by individuals, groups and cooperative farms. The MoA data for the 2016 main season indicates that 1.32 million hectares were planted with cereals, potatoes and soybeans, a 4 percent increase compared to the low level of 2015. The area under mostly irrigated paddy fields was reported at 469 000 hectares, with just a modest increase over the sharply-reduced levels in 2015, and still well below the levels in 2012 and 2013, mainly due to limited availability of irrigation water at sowing time. Some paddy fields were then diverted to alternative crops with relatively less water requirement, such as sorghum, millet and soybeans. The area planted with soybeans in 2016 was estimated to have increased by 11 percent to 175 000 hectares, showing a strong increase for the third consecutive year. Soybean is the most important source of protein in the country, and the area expansions in recent years is mainly the

result of the Government's efforts to enhance nutrition security and diet diversity through the support of its cultivation. In addition, the Government adopted measures to increase the area under legume "break"

crops. Soybeans play an important role in crop rotation by helping to improve nitrogen levels in the soil. Similarly, the area under minor crops, namely potatoes and other cereals (including sorghum, millet and buckwheat), also increased considerably compared to the 2015 level. By contrast, the area planted with maize in 2016 decreased slightly to 544 500 hectares from the previous year's level of 560 000 hectares. Recurrent periods of below-average rains between October and March reduced the area planted with the 2016/17 early season crops (minor winter/spring wheat and barley and potato crops), harvested in June

2017. As a result, the FAO estimates indicate that the area planted with 2016/17 early season crops have declined by some 15 percent to 140 000 hectares, due to low water availability.

**Crop yields and production:** The aggregate 2016/17 food crop production is estimated by the FAO at 5.96 million tonnes (in cereal equivalent and paddy



**Table 3: Democratic People's Republic of Korea - Comparison between 2016/17 and 2015/16 national aggregate production of food crops (cereal equivalent)**

	2016/17			2015/16			Change 2016/17 from 2015/16		
	Area '000 ha	Yield t/ha	Prodn. '000 t	Area '000 ha	Yield t/ha	Prodn. '000 t	Area %	Yield %	Prodn. %
<b>MAIN SEASON, Farm (Total)</b>	<b>1 315.6</b>	<b>4.1</b>	<b>5 443.6</b>	<b>1 260.7</b>	<b>3.8</b>	<b>4 778.2</b>	<b>4.4</b>	<b>9.2</b>	<b>13.9</b>
Paddy	468.7	5.4	2 536.4	465.2	4.2	1 945.8	0.7	29.4	30.4
Maize	544.5	4.0	2 195.2	559.8	4.1	2 287.8	-2.7	-1.3	-4.0
Other cereals	72.1	2.2	156.4	45.0	3.5	156.3	60.3	-37.6	0.1
Potatoes	55.0	5.0	273.6	32.3	5.2	168.3	70.4	-4.6	62.6
Soybeans	175.4	1.6	281.9	158.4	1.4	220.0	10.7	15.8	28.1
<b>EARLY SEASON (winter and spring), Farm (Total)</b>	<b>140.0</b>	<b>2.2</b>	<b>310.0</b>	<b>164.3</b>	<b>2.7</b>	<b>447.6</b>	<b>-14.8</b>	<b>-18.7</b>	<b>-30.7</b>
Wheat and barley 1/	40.0	1.5	60.0	64.3	2.1	133.4	-37.8	-27.7	-55.0
Potatoes 2/	100.0	2.5	250.0	100.0	3.1	314.1	0.0	-20.4	-20.4
<b>NATIONAL, Farm (Total)</b>	<b>1 455.6</b>	<b>4.0</b>	<b>5 753.6</b>	<b>1 425.0</b>	<b>3.7</b>	<b>5 225.7</b>	<b>2.2</b>	<b>7.8</b>	<b>10.1</b>
Sloping land	550.0	0.4	203.0	550.0	0.4	203.0	0.0	0.0	0.0
<b>TOTAL (including sloping land)</b>	<b>2 006.0</b>	<b>3.0</b>	<b>5 956.6</b>	<b>1 975.0</b>	<b>2.7</b>	<b>5 428.7</b>	<b>1.6</b>	<b>8.0</b>	<b>9.7</b>

<sup>1</sup> Includes a small amount of main crop wheat and barley grown mainly in North and South Hamgyong, and Ryanggang.

<sup>2</sup> Potatoes in cereal equivalent at 25 percent conversion rate.

Source: MoA

terms), 10 percent higher than the 2015/16 reduced level (see Table 3) and higher than the five-year average. The 2016 main season food crop production is estimated at 5.44 million tonnes, a 14 percent rebound from the 2015 drought-reduced level. The year-on-year increase is mostly attributed to a 30 percent recovery in 2016 paddy output, estimated at 2.54 million tonnes. At this level, however, paddy output in 2016 is still well below the output gathered between 2012 and 2014. Similarly to paddy, the output of other crops also rebounded from last year's low level. The 2016 production of soybeans is officially estimated to have increased by 28 percent to 282 000 tonnes, while the output of the 2016 main season potatoes is set at 274 000 tonnes, more than 60 percent above the level of 2015. Output of other crops, including sorghum, millet and buckwheat, remained close to last year's high level. The 2016 maize output is officially estimated to have decreased by 4 percent to 2.2 million tonnes, as a result of a small contraction in the area planted and yields, mainly due to flood damages in the North Hamgyong Province.

As for the 2016/17 early season, the prolonged period of dry weather from April to June, a critical period of grain filling, has negatively affected maturing crops, considerably reducing yields. Pending a more detailed official assessment, the FAO lowered the initial production forecast and currently estimates the 2016/17 early season crop production at 310 000 tonnes (cereal equivalent), over 30 percent less than in 2016. The early season potato production is estimated

by the FAO at 250 000 tonnes, 20 percent down from the previous year's level, while the small wheat and barley harvest is forecast at about 60 000 tonnes, less than half of last year's level. Crop production from sloping land is assumed to have remained similar to last year's level of about 200 000 tonnes.

### Food supply/demand balance for 2016/17

The food supply/demand balance sheet for the 2016/17 marketing year (November/October), including cereals and cereal equivalent of potatoes and soybeans, is summarized in Table 4. For the calculation of food consumption, the FAO/GIEWS cereal balance methodology has been applied. Specifically, the following assumptions were made in preparing the balance sheet:

**Population:** The total national population at the end of December 2013 was officially estimated at 24.88 million (including 700 000 special entity personnel). Applying an average annual population growth rate of 0.55 percent, calculated from official population estimates from 2008 to 2013, the population for November 2016 to October 2017 is projected at 25.23 million.

**Production:** The aggregate 2016/17 food production is estimated at 5.15 million tonnes (in cereal equivalent and rice in milled terms), including the FAO forecast of 310 000 tonnes of the early season (winter/spring) crops.

**Food use:** An annual per capita consumption of 175 kg of basic food commodities, covering cereals, potatoes and soybeans, is used. This rate is derived from the apparent per capita staple food consumption in the previous five years using historical data from the FAO/GIEWS cereal balances. The individual items are adjusted to match with the estimated availability during the current marketing year and to maintain a zero balance of non-traded commodities such as other cereals and potatoes. Per capita average consumption used is: 149.9 kg of cereals (including 59 kg of milled rice, 79.6 kg of maize, 6.5 kg of wheat and barley and 4.77 kg of other cereals), as well as 13.3 kg of potatoes and 12.3 kg of soybeans in cereal equivalent. Average per capita consumption rates of potatoes and soybeans have been increased to reflect the changes in crop production in 2016 compared to 2015. Cereals, potatoes and soybeans remain the main source of nutrition for the population. The estimated per capita food consumption of 175 kg represents about 1 640 kcal per person daily. The remaining energy and other nutrients required will likely be derived from the limited quantities of available fish, poultry, meat, sweet potatoes, vegetables, fruits and wild foods. However, it should be noted that the Government's target weighted average consumption

rate is considerably higher, at 207 kg per person per year, leading to a significantly higher estimate of the cereal import requirements.

**Feed use:** Information on the number of livestock in 2016 is not available but according to the official data, feed use is expected to increase by 11 percent. Last year's FAO's feed grain requirement was estimated at 120 000 tonnes, including 100 000 tonnes of maize and 20 000 tonnes of potatoes. As a result, the feed requirement in 2016/17 is estimated by the FAO at 130 000 tonnes, including 110 000 tonnes of maize and 20 000 tonnes of potatoes.

**Seeds:** A seed requirement of 252 000 tonnes is estimated, based on the seed rates used in the country and the average area sown in the past three years, allowing for some multiple planting/sowing.

**Crop losses:** In 2014, a study on the Post-Harvest Losses (PHL) of rice, maize, wheat and barley was carried out by the Pyongyang Agricultural Campus and Kim Il Sung University, in collaboration with the FAO and the UNDP. This study estimated the PHL rates at 15.56 percent for rice, 17 percent for maize and 16.35 percent for wheat, barley and other cereals,

**Table 4. Democratic People's Republic of Korea - Food balance sheet for marketing year November 2016-October 2017 ('000 tonnes)**

	Rice (milled) 1/	Maize	Wheat and Barley	Other cereals	Potatoes 2/	Soybeans 3/	Total
<b>DOMESTIC AVAILABILITY</b>	<b>1 674</b>	<b>2 398</b>	<b>60</b>	<b>156</b>	<b>524</b>	<b>338</b>	<b>5 150</b>
Main-season farm production	1 674	2 195		156	274	338	4 637
Winter/spring production			60		250		310
Production on slopes		203					203
Stock draw-down	0	0	0	0	0	0	0
<b>TOTAL UTILIZATION</b>	<b>1 800</b>	<b>2 600</b>	<b>189</b>	<b>157</b>	<b>524</b>	<b>339</b>	<b>5 608</b>
Food use	1 488	2 008	164	120	336	310	4 427
Feed use		110			20		130
Seed requirement	51	74	16	11	89	12	252
Post harvest losses	260	408	10	26	79	17	799
Stock build-up	0	0	0	0	0	0	0
<b>IMPORT REQUIREMENTS</b>	<b>126</b>	<b>202</b>	<b>129</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>458</b>
Anticipated commercial Import							200
Uncovered deficit							258

Note: Figures may not add up exactly due to rounding.

<sup>1</sup> Paddy to rice milling rate of 66 percent.

<sup>2</sup> Including potatoes in cereal equivalent at 25 percent conversion rate.

<sup>3</sup> Soybeans cereal equivalent using a factor of 1.2.

which are used in the balance sheet. As this study did not consider potatoes and soybeans, the rates of PHL used in the past FAO/GIEWS reports of 15 percent and 5 percent, respectively, have been applied.

**Paddy-to-rice milling ratio:** A milling ratio of 66 percent is used. This is consistent with the rates in other countries of the region. No other grains are converted to milled form as the food and non-food requirements are expressed in whole grain form.

**Soybeans:** Given that soybean is the principal source of protein in the country, this crop has been added to the balance sheet. On average, the calorie content of soybean is about 20 percent higher than that of

cereals, hence the production is multiplied by 1.2 to express the availability in cereal equivalent terms.

**Stocks:** In the absence of official information on opening and closing stocks, no changes are envisaged or all crops.

**Cereal import requirements:** The total cereal import requirements in 2016/17 (November/October) are estimated at 458 000 tonnes. Assuming the official import target of 200 000 tonnes of cereals is met, there is an uncovered deficit of 258 000 tonnes for the current marketing year. This food gap is lower than the level of the 2015/16 marketing year, but still higher than the 2012/13 and 2014/15 levels.

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