S P E C I A L R E P O R T

FAO/WFP CROP AND FOOD SECURITY ASSESSMENT MISSION TO THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME

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TABLE OF CONTENTS

Mission Highlights

1. In DPRK, staple food production in 2012/13 is estimated to increase for the second consecutive year, reflecting improved yields, by about 10 percent over the revised above-normal production in 2011/12.
2. A total of about 5.8 million tonnes of food output from cooperative farms, individual plots on sloping land and household gardens for 2012/13 is expected, including estimates for the 2012 main season harvest and the forecast for 2013 early season crops. When paddy is converted to milled rice and soybeans to cereal equivalent, total production is estimated at 4.9 million tonnes.
3. Despite some flood damage in July-August to paddy crop in the main grain producing provinces, the timely availability of key inputs and an increase in the State procurement prices resulted in an overall increase in the main season crop harvest. Furthermore, the impact of the prolonged dry spell in the first half of the season was largely mitigated by increased irrigation efforts including mass mobilization of people to water maize plants.
4. Soybean production, on the other hand, decreased this year by over 30 percent, primarily due to the dry spell. Given the overall inadequacy of pulse production, efforts should be redoubled, including more favourable pricing of the commodity in relation to other cereals, to increase the protein content of the diet.
5. The second consecutive poor harvest of early crops has resulted in a shortage of wheat, barley and potato seed for the 2013 winter and spring crops. Overall, production from the early season crops over the last several years has been on a negative trend.
6. Based on the Mission's estimate of total utilization needs of 5.43 million tonnes of cereal equivalent (rice in milled terms), the Mission estimates cereal import requirement of 507 000 tonnes for the 2012/13 marketing year (November/October). Assuming the official target of 300 000 tonnes of food imports, the Mission estimates an uncovered food deficit of 207 000 tonnes for the 2012/13 marketing year. This food gap is the narrowest in many years mainly due to the improved harvests.
7. Household food consumption has improved but serious gaps remain between recommended and actual nutrient intake. The predominant share of the population remains food insecure and highly vulnerable to production shocks.
8. Acute malnutrition rates seem to have improved this year due to better food rations and a consistent food assistance pipeline. Chronic under-nutrition however remains a public health problem.
9. The Mission recommends that international support be focused on expanding and developing nutrition programmes specifically targeted to about 2.8 million vulnerable people (children, pregnant and lactating women, elderly and disabled or chronic ill) in five provinces in the North-East of the country.
10. In order to improve food security in the short to medium term, the Mission also makes recommendations for national and international support for - (i) increased production of protein commodities, namely soybean cultivation and fish pond development, (ii) revitalization of the double-cropping programme by providing inputs (e.g. seeds and fertilizer for the early crops wheat, barley and potatoes), improved mechanization and sufficient incentives to cooperative farms, and (iii) general assistance for household garden production. In the medium to longer term, adoption of incentive system through relevant changes in agricultural marketing would help elevate production and improve the country's food security.

1. OVERVIEW

1.1 Mission organization

An FAO/WFP Crop and Food Security Assessment Mission (CFSAM) visited DPRK, at the request of the Government, from 24 September to 8 October 2012 to assess the 2012 main crop harvest, forecast the 2013 production of winter and spring crops, estimate cereal import requirements for the 2012/13 marketing year (November/October), assess the household food-security situation and estimate food assistance needs.

The Mission was divided into four teams to allow adequate time in each province, given the large geographic area visited during the ten days in the field and visited 27 counties in all nine agricultural provinces, representing a wide range in terms of their contribution to food production (low, medium and high), importance to shocks experienced (dry spell and floods), and prevalence rates of undernutrition. Provinces and Counties visited, include: Ryanggang (Pochon and Hyesan City); North Hamgyong (Kilju, Orang and Chonjin City); South Hamgyong (Yonggwang, Kowon, Hamju and Hamhung City); Kangwon (Tongchon,

Chonnae, and Anbyon); Chagang (Huichon City); North Pyongan (Yomju, Pihyon and Hyangsan); South Pyongan (Mundok, Anju City and Kaechon City); North Hwanghae (Sariwon City, Songnim City, Hwangju and Phyongsan); and South Hwanghae (Jaeryong, Unryul, Sinwon and Paechon). The Mission did not conduct field visits in the two urban provinces of Pyongyang City and Nampho City.

Mission members represented a wide variety of skills and perspectives on agriculture and food security. Korean speaking international staff and consultants accompanied the teams in the field. Two observers, one representing the EU and another Australia joined the mission for parts of the mission period.

The Government provided the Mission with official crop area and production estimates at county, province and national level and other relevant information, including: records of cereal imports and bilateral food assistance; demographic data for each county; PDS ration levels and food transfers; and meteorological data. The Mission reviewed and, where necessary, adjusted the estimates in light of interviews with Government and cooperative-farm officials, observation of standing and harvested crops, and evaluation of the remote sensing imagery on rainfall and vegetation. An estimate of the extent of crop production on sloping land was provided by the EU's Joint Research Centre (JRC) following a study it carried out using photo-interpretation of remotely-sensed imagery.

The Mission met with Government officials at national, provincial and county levels, and visited cooperative farms, and rural and urban households in all the selected provinces. The Mission also visited and interviewed the staff of nurseries, hospital paediatric wards, Public Distribution Centres (PDCs) and some county grain storage facilities. Discussions were held with staff of UN agencies, NGOs (locally known as EU Project Support Units), resident diplomatic missions, and the Swiss Development Cooperation (SDC).

This year for the first time the mission was able to carry out crop yield estimations by limited sample crop-cutting using the same method as the cooperative farms to forecast crop yields. For paddy, a circle of crop measuring 1 *pyong* in a field ready for harvest was cut, and the seed removed and weighed. Provision was made for moisture content in the subsequent calculation of yield. The results of these sample crop-cuttings indicated yields very closely in line with those reported by the farms.

The Mission interviewed a total of 95 households using a structured household questionnaire. In each counties visited, 3 to 4 households were selected. Based on request by the Mission these selected households could be among cooperate farmers, PDS dependents, in rural (ri) or in urban (up) areas. The ultimate sample consisted of 62 PDS dependents and 33 cooperative farmers. 51 interviews conducted were with households in urban areas and 44 with households in rural areas. The Mission also visited 25 paediatric wards and hospitals and 13 nurseries in the 27 counties. Doctors, nurses and nursery managers were asked specific questions on the malnutrition situation of children. Results from the recently conducted review of the WFP Emergency Operation in July 2012 were also taken into consideration to triangulate the household findings. However, the sample cannot be treated as representing the entire population as it is too small and not drawn in a statistical random manner. The results presented in this report should, therefore, be considered as indicative only.

1.2 Food production and overall deficit

This year the cropping season started favourably. The winter was less severe and less prolonged than in the previous two years, and rainfall in April was promising. However, this was followed by a prolonged dry spell during May and June, which had a particularly serious effect on winter and spring cereals and on early vegetables, the yields of which were significantly depressed. The prolonged dry spell necessitated the re-planting of large areas of main-season crops, especially maize. July saw some serious flooding, mainly in the agriculturally important provinces of North and South Pyongan, and at the end of August the country was hit by Cyclone number 15 (Bolavan) which caused some crop damage, especially in North and South Hwanghae and South Hamgyong.

On the other hand, there was much more sunshine this year and temperatures were conducive to good crop growth. The amounts of most inputs received by cooperative farms this year - seed, fertilizer, diesel, pesticides - were similar to those of last year but the timeliness of delivery was much improved. An exception was the supply of plastic sheeting for paddy nurseries which was substantially increased this year. These factors and the huge effort put into minimizing the adverse effects of the dry spell at the beginning of the season have been the chief contributors to this year's better harvest.

The expectations for the coming winter and early crops which will be harvested in the first half of 2013 have been lowered slightly from the usual target due to the shortage of winter and spring cereal seed resulting from the poor harvest this year.

For 2012/13 the Mission estimates an overall production of 5.8 million tonnes (in cereal equivalent), an increase of about 10 percent on last year. This figure includes main-season crops and winter and early crops produced on cooperative farms, and production from sloping land, home gardens and kitchen gardens; it excludes production from state farms. Paddy and maize yields were both higher than last year, but soybean area and average yield were both substantially lower than in 2011.

After converting paddy to milled rice and taking total utilization needs for the year, an import requirement of 507 000 tonnes of cereals is estimated for 2012/13 marketing year (November/October). Considering the planned Government imports of 300 000 tonnes, the Mission forecasts an uncovered food deficit of 207 000 tonnes. This is much lower than the usual food gap and is mainly explained by better harvest.

1.3 Household food security

Despite a better harvest, the food system in DPRK remains vulnerable to production shocks. Most risks are PDS dependents without access to kitchen gardens or relatives at cooperative farms. Especially large households with a high dependency ratio are at risk. PDS dependents in urban areas are more vulnerable to reductions in PDS rations as cooping options including wild foods and self production from kitchen gardens are more limited. Households cope with food insecurity by relying on family support, searching for wild foods and adding water to meals.

The households food security situation has improved compared to last year but food rations remain too tight to take away household's anxiety about whether they will have access to sufficient food. Because of this the predominant share of the population remains food insecure. There are indications that the nutrition situation has improved from last year but this will need to be confirmed by the results of the national nutrition survey which will be made available at the end of this year.

2. OVERALL ECONOMIC SETTING AND AGRICULTURE IN DPRK

2.1 Macro-economy[1]

Economic performance in DPRK in the last six years (2006-2011) had been relatively subdued (see Table 1). With three of the six years experiencing negative growth, the overall cumulative real gross domestic product (GDP) rose by about 3 percent in six years, implying an annual compound growth rate of about 0.4 percent. After considerable turbulence in last several years, DPRK's GDP increased by 0.7 percent in 2010 and further strengthened in 2011, expanding by 1.9 percent. In general, the recent economic recovery has been due to the relatively good performance of the agriculture sector, significant expansion of the construction sector, exports of natural resources such as iron, coal, fish and timber, as well as remittance inflows into the country from North Korean workers sent to China and Russia. In 2011 DPRK's agriculture, fishery and forestry industries expanded by 5.3 percent, from a 2.1 percent contraction in 2010. Volatility in agricultural production remains a major challenge in maintaining a stable economy and improving living standards of the population. Similarly, the volume of construction output rose, as a result of increased housing in Pyongyang, as well as other factory constructions. Meanwhile, manufacturing (which includes heavy industry and chemicals production) and utilities output has softened compared to the last year.

Economic trade of DPRK is limited to a very few countries, with China and the Republic of Korea (ROK) being the most important trading partners, accounting for almost 90 percent of international trade in 2010. Based on available statistics, the total trade deficit increased by almost 50 percent in five years, rising from USD 983 million in 2003 to an estimated record high of USD 1.52 billion in 2008. Although imports increased, annual trade deficit decreased to USD 974 million in 2010 as a consequence of an increase in exports mainly to China. Trade with China increased from about 36 percent of the total in 2009 to 57 percent in 2010. China is currently the only foreign investor, mainly investing in mining, roads, railways and other infrastructure. The trend of exports to China is expected to continue.

[1] Based on EIU, Bank of Korea, and Korea Development Institute, Seoul publications.

Table 1: DPRK - Key economic indicators, 2006 to 2012

	2006	2007	2008	2009	2010	2011	2012 (Jan. to Aug.)
Real GDP growth (%)	- 1.0	- 1.2	3.1	- 0.9	0.7	1.9	…
Real GDP Index (2005 =100)	99	98	101	100	101	103	…
Exports (USD million)	1 467	1 685	2 062	1 994	2 554	…	…
Imports (USD million)	2 879	3 053	3 578	3 095	3 528	…	…
Trade deficit (USD million)	1 412	1 368	1 516	1 101	974	…	…
Exports to China (USD million)	…	…	…	348	1 195	2 476	1 716
Imports from China (USD million)	…	…	…	1 473	2 277	3 165	2 306
Trade deficit with China (USD million)	…	…	…	1 125	1 083	…	…
% of trade with China in total	…	…	…	36	57	…	…

Source: Economist Intelligence Unit, October 2012 Country Report and earlier issues, 2010 to 2012 Official Chinese Customs data.

ROK was until recently DPRK's top export destination accounting for about half of all exports. However, strained political ties between the two countries and subsequent trade ban in 2011 have severely impacted exports and reduced foreign currency earnings of DPRK.

2.2 Food imports

DPRK has been dependent on significant quantities of food import, in recent years ranging from a high of 938 000 tonnes in 2005/06 to a low of 293 000 tonnes in 2008/09 (see Figure 1). In general, commercial imports have been relatively stable since 2009/10, while international assistance, bilateral as well as multilateral food aid, has significantly increased, especially from traditional donors. During the 2011/12 (November/October) marketing year, DPRK imported 711 340 tonnes of food.

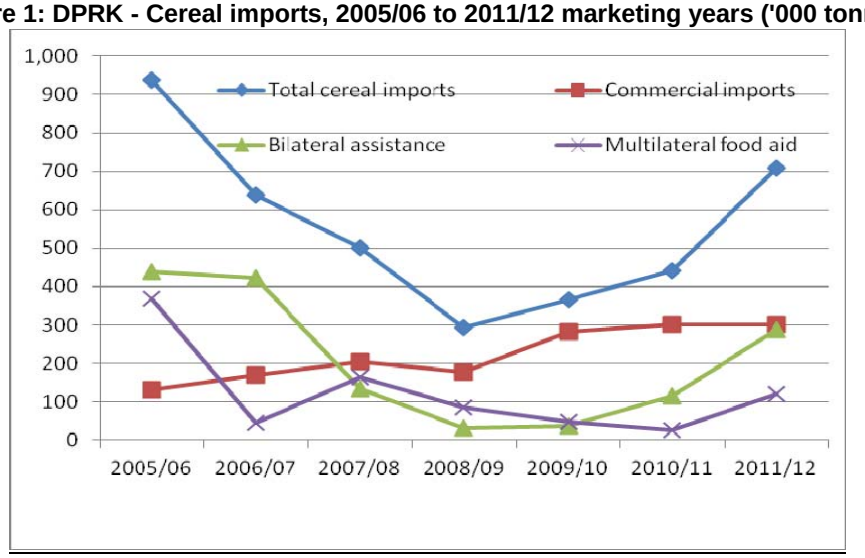
Bilateral and Multi-lateral food assistance

In 2011/12 both bilateral and multi-lateral food assistance increased compared to the previous year's level. During this year the major bilateral source was China (including Taiwan) with 220 000 tonnes of maize and 33 211 tonnes of rice, followed by Russia with 34 000 tonnes of wheat. Prior to 2009, DPRK received more than 400 000 tonnes of rice per year in bilateral assistance from ROK and additional multilateral assistance through WFP. Following the strained ties between the two countries, bilateral and multi-lateral food assistance from ROK declined significantly since 2010. China continues to be the main contributor to food aid, as well as critical non-food assistance, including fuel and agricultural support. During this year the major bilateral source was China (including Taiwan) with 220 000 tonnes of maize and 33 211 tonnes of rice, followed by Russia with 34 000 tonnes of wheat. The multi-lateral cereal food aid has decreased from 368 706 tonnes in 2005/06 to a low of 26 029 tonnes in 2010/11; but rose back up to 120 573 tonnes during 2011/12, averaging around 89 000 tonnes over the last five years.

Commercial cereal imports

Commercial cereal imports to DPRK have remained stable at around 300 000 tonnes in recent years. During the 2011/12 (October/September data), despite increasing international commodity prices, the government managed to commercially import 303 236 tonnes, mainly maize from Argentina, wheat from Russia and rice from China. However, the commercial import capacity of the country is constrained due to a significant overall trade deficit and poor domestic economic performance. Commercial imports need to continue to increase in order to avoid undernourishment of the population.

Figure 1: DPRK - Cereal imports, 2005/06 to 2011/12 marketing years ('000 tonnes)



Source: National Coordination Committee, Government of DPRK; for 2010/11 and 2011/12 additional data on commercial imports from Chinese Customs.

2.3 Economic policy changes

Bonuses for cereal production: One of the major changes during 2012 has been the increase in the effective price of the major cereals by the introduction of a bonus, KPW 10/kg for paddy, maize, wheat and barley (Table 2). This was announced well in advance in time for the procurement of the early season crops. For the main-season crops, in relative terms, maize price increased by 50 percent, which may have contributed to the production increase (10 percent) of the crop in this year's harvest. Bonuses for potatoes and soybean were much smaller, and coincidentally both crops have seen a reduction in production. It should be noted however that although this indicates an increase over 2010 and 2011 farm prices, the absolute level is still below the level in 2009, before the so called "redenomination of currency" reform. For example, the procurement price of paddy was KPW 42/kg in 2009 before it was reduced to KPW 29/kg in 2010. The reform of 2010 had also reduced prices of farm inputs.

The supply prices charged at the public distribution centres to all buyers have been typically lower than the Government procurement prices, implying a huge Government subsidy to consumers (Table 2). It was understood that farmers also benefit from this consumer subsidy as they have to buy back their ration allotment, at least on paper. Although the national-level cost of this subsidization is substantial, it shows that incentives through a bonus mechanism could have a positive impact on food production. Examination of alternative measures to introduce incentives, particularly through agricultural commodity marketing changes, may be necessary to achieve better economic efficiency.

The price of soybean relative to maize and paddy is extremely low. To make soybean equally profitable for farmers, its price would have to be almost 2.5 times the price of maize given the lower productivity of soybean compared to maize. Hence, to increase soybean production, its pricing policy needs to be examined.

Table 2: DPRK - Official prices of selected farm outputs and inputs, 2012 and 2011

	Purchase Price			Supply price (PDC price)		
	2012 1/	2011	% increase 2012/2011	2012	2011	% increase 2012/2011
Crops (KPW/kg)						
Paddy 2/	39	29	34	22	18	21
Maize	30	20	50	20	14	43
Soybean	44	40	10	34	24	42
Wheat	32	22	45	22	17	29
Barley	28	18	56	--	--	--
Potatoes fresh wt	9	8	13	9	8	13
Farm Inputs						
Urea fertilizer (KPW/t)	34 000	30 000	13			
Diesel (KPW/litre)	38.7	38.7	0			

1/ Including KPW 10/kg of bonus for paddy, maize, wheat and barley; KPW 4/kg for soybean.
2/ Paddy supply price calculated from milled rice price of KPW 24/kg, using the official 75 percent milling rate.

Marketing changes: No radical reform relating to agriculture is expected. However, some changes with respect to the marketing of staple crops (most cereals and potatoes) produced on cooperative farms in a few selected counties on a pilot basis are expected. The current system allows farmers to keep only the amount based on their nationally fixed ration calculation; the remainder is sold to the State Procurement Agency at the state-determined prices. If this system were to be changed so that the State acquires a certain quota level (or certain percent of the production) and lets the farmers keep the remainder for their own consumption and sell any surplus in farmers' markets. This would provide an incentive for farmers to produce more, provided that input limitations do not constrain the production. Currently yields of most staple crops have stagnated. Therefore, this type of new marketing policy, among other alternatives, would be worth considering as it has the potential to increase national cereal production.

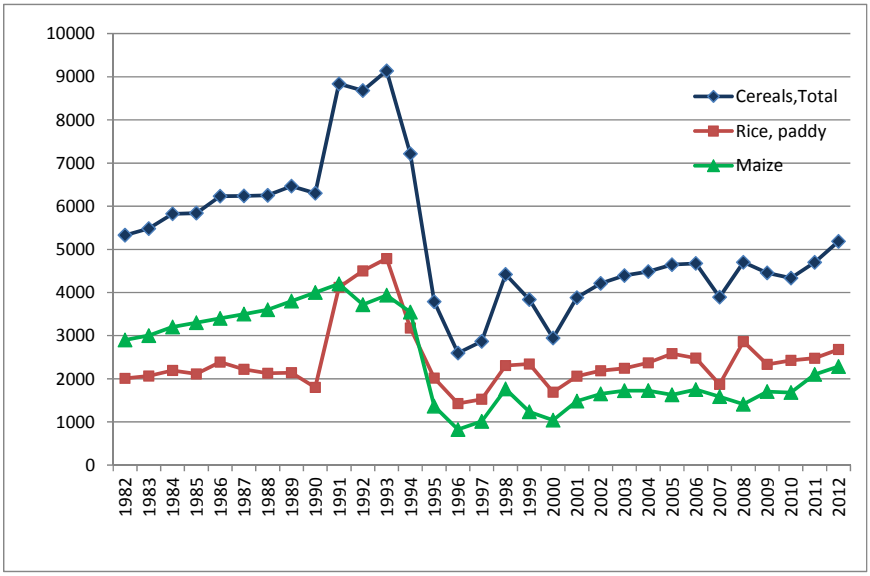
Farmers markets: The introduction of farmers' markets in 2003, held three times a month (on 1st, 11th and 21st of each month) has been seen as an important market reform. It has, in general, helped to improve the efficiency of production, distribution and consumption of non-staple but essential commodities such as vegetables, potatoes and green maize from kitchen gardens; in addition, it has also increased access to a variety of consumer goods. Cooperative farms, however, do not have direct access to these markets to sell their staple food commodities. Any surplus over and above their grain allocation for home consumption must be sold to the State Food Procurement Agency (Food Administration Department). They also have to sell their non-cereals produce to the Agency that buys it for distribution through State Shops.

Informal markets: When the PDS broke down during the famine years of the 1990s, informal market mechanisms developed. Although restricted after 2005 and their presence has been cyclical, they exist and continue to provide an important source of food, particularly when the PDS is not able to supply cereal in sufficient quantity. The mission believes that these informal market mechanisms played a critical role in helping households to source cereal during the lean season in 2011. As sale of cereals is officially prohibited, questions about this type of market activity usually do not receive direct answers. Households interviewed were quite comfortable describing exchanges of cereals as gifts or barter.

2.4 Agricultural sector

Agriculture, including forestry and fisheries, is the biggest contributor to GDP. However, its contribution to the national income has declined from about 30 percent in the early 2000s to some 21 percent in 2010. The performance of the sector has been erratic with negative growth rates in several years in the recent past. Natural disasters such as droughts, floods, tidal surges, hailstorms, typhoons and extremely cold winters have affected agriculture with a varying degree of severity with consequent adverse impacts on food production, especially during 1996, 1997, 2000, 2007, 2009 and 2010 (see Figure 2). In spite of the generally positive trend in cereal production since 2000, the current 2011 and 2012 output level remains well below the plateau of 6 million tonnes achieved in the late 1980s through cooperation within the former Soviet Union trading arrangements. However, cereal production is estimated to increase for the second consecutive year in 2012, and exceed 5 million tonnes for the first time since 1994. Despite this improvement, major challenges remain to reach that potential level of food production recorded in the 1980s.

Figure 2: DPRK - Cereal production 1981-2012 ('000 tonnes) 1/



Source: 1982 to 2009 FAOSTAT; 2010 to 2011 Ministry of Agriculture and 2012 CFSAM.
1/ Total cereals include only cereals (exclude potatoes and soybeans).

The precarious foreign exchange situation has not allowed adequate commercial imports of much needed agricultural inputs such as fertilizer, pesticides, plastic sheeting, spare parts for machinery, tyres for tractors and trucks, fuel. Over the years, domestic production of fertilizer has declined to a level of about 10 percent of total requirement, increasing dependence on fertilizer and reducing its use. Much needed lime application to improve fertility of acidic soils, although improved lately, is constrained by the lack of transport facilities and fuel availability. Yields of the main paddy crop used to be around 7 or 8 tonnes/hectare during the 1980s, but are now estimated to be about half that level, due to a departure from sound agricultural techniques and the lack of agricultural inputs. In order to increase total food production in the country, every possible piece of cultivable land, including plots with extremely high slopes in mountainous areas, are being brought into production under a temporary derogation of official policy. Although the Ministry of Land and Environmental Protection (MOLEP) has devised regulations for sloping lands and re-forestation, the rehabilitation and renewal progress has been slow. Cultivation of marginal lands has unintended consequences of soil erosion, increased risk of flood damage to more productive lowland, and further reduction in overall land productivity. Thus productivity improvement is desperately needed. Increase of leguminous crops and potatoes in the crop rotation system is vital. A greater emphasis on pulse crops would also help improve the protein content of the national diet.

Mechanization on the farms perhaps represents the biggest challenge and biggest potential in DPRK. With the recent rehabilitation of old tractors and acquisition of some new tractors, the operational rate on farm tractors has improved and ranges from 68 to 74 percent by province, up from a national figure of 57 percent in 2004. The major constraint, in addition to the old technology machinery, seems to be the shortage of spare parts, tyres and fuel. But these are improvements only to a mechanization strategy that was established in the 1960s whereas fundamental new strategies and technologies are needed to meet the demands of agronomic advances in conservation agriculture, double cropping and intercropping.

The agricultural marketing system is tightly controlled as all cereals, soybean and potato output of the cooperative farms must be sold to the State. Although the prices offered to cooperative farms seem attractive, especially during the 2012 season when farmers were offered KPW 10/kg of main staples as a "bonus", the net income of farmers varies widely depending on the surplus they can produce and the cost of inputs. Prices of farm inputs are also set by the State; they remained more-or-less same as in 2011. Lack of access to farmers' markets at least for the produce over and above the allocated production quota remains a major limitation. A meaningful reform in the marketing system may provide necessary incentive to farmers to produce more on the cooperative farms as well as on their own small kitchen garden plots and help alleviate critical shortage of staple food in the country.

3. FOODCROP PRODUCTION IN 2012

3.1 Climate

DPR Korea has a continental climate with a relatively short cropping season. Long winters bring bitterly cold and clear weather interspersed with snow storms as a result of northern and north-western winds that blow in from Siberia. The weather is particularly harsh in the northern, mountainous regions. Summers tend to be short, hot, humid, and rainy because of the southern and south-eastern monsoon winds that bring moist air from the Pacific Ocean. On average, approximately 60 percent of all precipitation occurs between June and September. The distribution of the remaining 40 percent of precipitation is less reliable, and droughts are common in spring, winter and autumn. Typhoons affect the peninsula on average at least once every summer. Spring and autumn are transitional seasons marked by mild temperatures and variable winds.

Single cropping is practised in the north of the country, but in the south, where the winters are less severe and slightly shorter, some double-cropping is possible (see Figure 4). The country's relative shortage of arable land means there is pressure to exploit this potential wherever possible. For various reasons however the extent of double-cropping is limited, and this is discussed further below.

The winter of 2011/12 was less severe and of shorter duration than the two preceding winters, and with adequate rainfall in April the prospects for crop production looked especially promising. However, the relatively mild temperatures and good rainfall of April were followed by a prolonged dry spell that stretched through May and June. Some counties reported more than 60 days of zero or negligible rainfall, with conditions only improving by the beginning of July, and some normally perennial rivers were said to have run dry. The dry spell had a significant negative impact both on yields of winter wheat and barley, which were then at the flowering stage, and on the production of early vegetables, the area and overall yield of which were both reduced. It also necessitated several re-plantings of maize in most regions, and mass mobilization of the available workforce in the worst-affected areas to combat the dry conditions by digging wells, and pumping, carrying and applying water to young plants in the field. Paddy was less affected than maize by virtue of it being grown in fields set up for irrigation. Occasionally paddy fields, especially those where irrigation water had to be pumped up through a series of pumps, were given over to other crops.

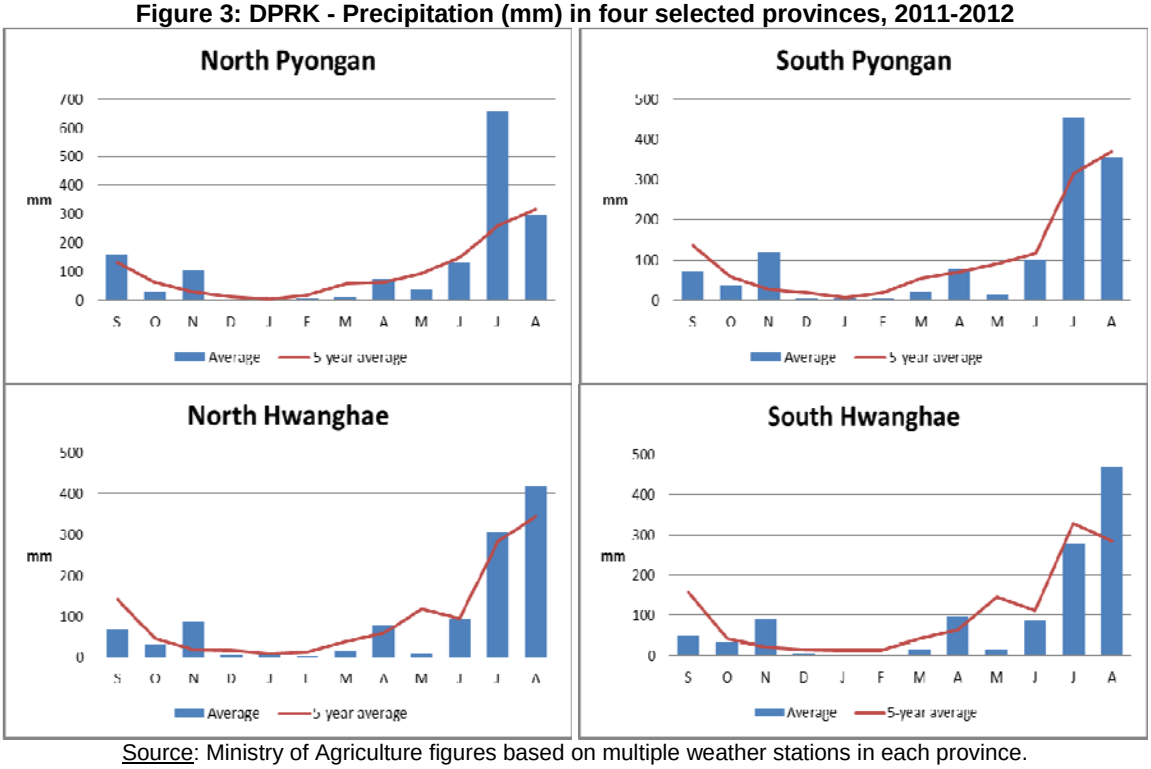
Serious flooding was recorded in July, mainly in the agriculturally important provinces of North and South Pyongan. This resulted in some loss of cropped area (reportedly 7 580 hectares buried and 2 830 hectares washed away nationally) and a slight reduction in the yield of crops that had been submerged for up to 48 hours. However, the floods generally caused much more damage to infrastructure than to cropland. Many farm fish ponds were also flooded with the loss of fish stock and partial filling with flood-borne sediment.

At the end of August the country was hit by Cyclone number 15 which caused some crop damage, especially in North and South Hwanghae and South Hamgyong. Although totals of 266 hectares and 738 hectares of crop land were reported as having been buried and washed away respectively, the greatest impact of the cyclone was the flattening of crops, mostly maize, by high winds. More than 47 000 hectares of crops were reported to have fallen, much of which, in the case of maize, was subsequently harvested prematurely. Some localised heavy rainfall at the end of September and the beginning of October set back the harvesting of crops that were still standing in parts of Chagang, North and South Pyongan, and North and South Hamgyong.

On the bright side, there was much more sunshine this year than last, and temperatures, apart from some unseasonally low summer temperatures in parts of the north, were generally conducive to good crop growth.

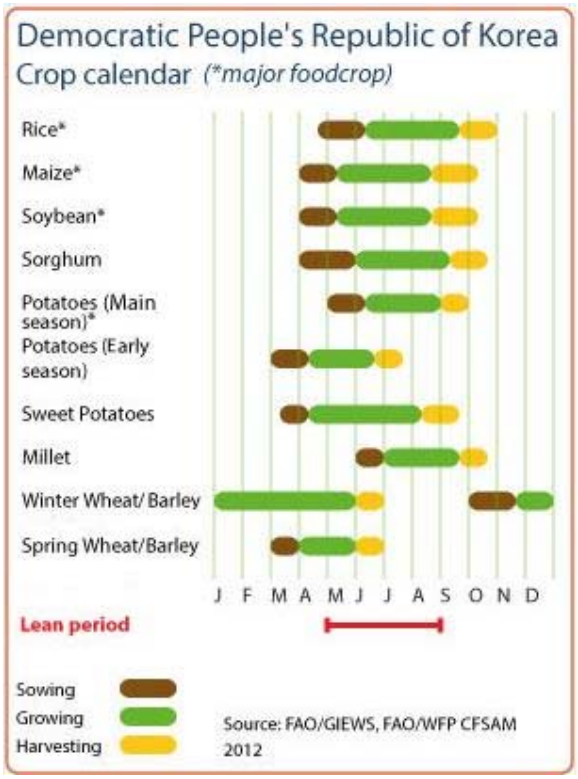
Figure 3 shows the patterns of precipitation for the twelve month period September 2011-August 2012 in DPRK's four most agriculturally important provinces, compared with the average patterns of the previous five years (2006-2010). The charts clearly show the rainfall deficit in May and June, the deficit being greatest in May. The appearance of less deficient rainfall in June is due to the heavy rainfall at the end of the month which heralded the end of the dry spell. The heavy rainfall of July that led to flooding in North and South Pyongan is also apparent in the charts, as is the above-average August rainfall in North and South Hwanghae, much of which was attributable to Cyclone number 15.

Figure 3: DPRK - Precipitation (mm) in four selected provinces, 2011-2012



Source: Ministry of Agriculture figures based on multiple weather stations in each province.

Figure 4: DPRK - Crop calendar



3.2 Area planted

DPRK's total land area amounts to 122 543 km^2, of which an estimated 17 percent, or slightly more than 2 million hectares, is cultivated by cooperative farms. Of this, approximately 1.4 million hectares are

considered suitable for cereal cultivation, 0.3 million hectares are under vegetable crops, some 160 000 hectares under fruit orchards[2], and the balance is industrial crops such as mulberry, cotton, tobacco and ginseng. In addition, about 0.4 million hectares are farmed by government institutions on state farms; many of these state farms are dedicated to such activities as livestock breeding and seed production. The CFSAM considers only the production from cooperative farms.

As a result of the country's mountainous terrain the scope for expanding the cultivable area is extremely limited. For this reason, emphasis has been placed recently on increasing production by double-cropping. However, because of the relatively short cropping season, the frequently prolonged and harsh winter, and the uncertainty of the spring weather, this often results in disappointing production from a significant investment in terms of seed, fuel and manpower (see section below on double cropping).

The area under main-season cereals, potatoes and soybeans this year amounted to 1.265 million hectares, a reduction of 0.2 percent on 2011 (Table 7). With regard to the winter and spring cereals which will be harvested in 2013, a significant reduction in area (16 percent) is expected on account of a shortage of seed following the poor harvest of these crops in 2011/12 (Table 7). In aggregate, and including home - and kitchen-garden and sloping-land production, the 2012/13 cropped area is estimated, at 2.025 million hectares, to be approximately 1 percent less than that of 2011/12.

Paddy

Paddy is the most important crop of DPRK in terms of both area cultivated and production (though milled rice production is second to that of maize). Paddy is grown mainly in the central, south-western and south-eastern parts of the country (the lowland parts of North and South Pyongan, North and South Hwanghae, Pyongyang, Nampo and Kaesong, collectively known as the "Cereal Bowl") and on the narrow eastern coastal strip comprising parts of Kangwon, and North and South Hamgyong Provinces. Smaller areas are also cultivated in Chagang and Ryanggang provinces. From the early 2000s a large-scale realignment operation to improve the size and layout of paddy fields, increased the overall paddy production area by, according to the Ministry of Agriculture, about 60 000 hectares. In 2012, the area under paddy was reported as 563 237 hectares, representing a reduction of about 1 percent from the 571 364 hectares of 2011. Much of this small reduction was attributable to the dry spell in May and June when some paddy fields which were difficult to irrigate and were consequently put under alternative crops.

Maize

Maize, which is more universally distributed than paddy, is normally grown under rainfed conditions, though this year much of the young crop was initially irrigated, either manually or mechanically, during the dry spell of May and June. This year's maize area of 531 000 hectares was 6 percent larger than the 503 000 hectares of last year. Although a small amount of this increase may have been due to maize replacing paddy in some fields that were difficult to irrigate, most was due to farms switching from soya to maize in pursuit of higher gross yields. DPRK is the only country worldwide to transplant maize on a wide scale in order to accommodate double-cropping and to give the crop a good early start in what is a relatively short growing season.

Potato

Potatoes are grown as an early (spring) crop in the Cereal Bowl, and as a summer main crop in the cooler, northern highlands (Chagang, Ryanggang), where the growing season is short. As an early crop, potato is sown in March-April and harvested in June-July, while as a main crop it is sown in May-June, following the winter and spring cereal harvest, and harvested in September. In response to a national potato campaign inspired by the reduced productivity of the main cereals since late 1990s, and because potato potentially produces far more carbohydrate per hectare than almost any other crop, the area under potato has generally been increasing in the major agricultural areas over the past 12 or so years. However, the area under main-crop potato decreased this year by 22 percent to 26 479 hectares from 34 000 hectares in 2011. The availability of planting material is the single most important limiting factor to the expansion of the area under potato, and it was this, following last year's disappointing production and heavy storage losses during the preceding two severe winters, which contributed to the reduced main-crop area this year. On the other hand, much greater emphasis has recently been placed on the early crop, and next year is expected to see an

[2] The management of orchards, which used to be under the direct control of the cooperative farms, is gradually being taken over by the National Fruit Agency in order to increase efficiency through economies of scale and enhanced access to new technologies.

increase of about 2 percent in area of early-crop potato. Overall, the area of potato for 2012/13 (main-season crop being harvested in 2012 and the early crop to be harvested in 2013), is estimated at approximately 131 000 hectares, about 4 percent down on that of 2011/12.

Winter wheat, and spring wheat and barley

Winter wheat is sown from the end of October to mid-November, immediately after the harvesting of the main-season crops. Factors influencing the area under winter wheat include: autumn rainfall; seed availability; access to adequate farm power, fuel and labour in the autumn at a time when the demand for these is high for other operations such as the harvesting of paddy; and the anticipated availability of labour, machinery and fuel during the short harvest window of seven to ten days in mid-June.

Winter wheat and spring barley are produced in all provinces except Ryanggang and North Hamgyong. They were the main cereals in the Double-Cropping programme initiated in 1996 jointly by FAO and UNDP as part of the Government framework for agricultural recovery. However, since then, the low survival rate of winter wheat during a series of severe winters has prompted farms to place increasing emphasis on early potatoes, though as yet with only minor reductions in the area under winter wheat.

The total area under wheat and barley was 95 080 hectares in 2011/12, of which 78 percent was spring-sown. The planned area for 2012/13 is 90 000 hectares but it is anticipated that with a possible shortage of seed only 80 000 hectares will be reached. The Ministry of Agriculture is currently seeking seed supplies of appropriate varieties.

Soybean

In contrast to last year's very substantial increase in the area under soybean, 2012 saw a significant reduction in area of 12 percent from 131 000 hectares to 115 000 ha. The main reason for this reduction may have been the unusually dry weather in May which is the time of planting for soya, but two other factors may also have contributed. Firstly, soya yields are low compared with those of maize and seed rates are higher, so for a farm manager wishing to produce more tonnage, maize is a more attractive option than soya. And secondly, soya is pre-eminently an industrial crop which is destined for processing into secondary food products rather than for direct consumption; for a farm or county wishing to increase its food production, maize may therefore be the preferred option. However, since soya plays an important role in crop rotations by helping to fix nitrogen in the soil, and the provision of dietary protein, the pricing of this crop relative to maize needs careful re-examination.

Other crops

Other crops produced in DPRK include sorghum, millet, sweet potato, buckwheat, mulberry, vegetables (mainly cabbage, spinach, radish, cucumber, eggplant and tomato) and fruit (mainly pears, peaches, apricots, apples and persimmons). Other field crops (mainly sorghum, millet, sweet potato and buckwheat) are estimated to have been produced on 28 880 hectares in 2012. This area is similar to that of last year and represents just over 2 percent of the cropped area of the cooperative farms.

Home gardens and kitchen gardens

Each cooperative farm household is entitled to a private home garden of up to 30 pyong, which equates to about 100 m^2. A recent informal survey indicates that the size of a home garden can vary considerably from household to household but the average size is close to the maximum stipulated 30 pyong. There are about 1.7 million farm households in the country, which translates to about 17 000 hectares of home gardens. In addition, a significant proportion of the 4.3 million urban households also have access to smaller home garden plots, typically between 5 and 10 pyong in size. Kitchen gardens belong to a different category. These are gardens that are allocated to institutions or factories for the production of food crops for their staff and workers. Their size may vary according to the size of the institution or factory. In the absence of more reliable quantitative data, it is assumed that the country's total home-garden and kitchen-garden area may be about 25 000 hectares.

Sloping land

It is difficult to estimate the area of sloping land (gradient > 15^o) used for crop production in DPRK. Its highly visible nature tends to exaggerate its extent; and a slope presents a wider angle of view to an observer on the ground than does a similar area of flat land. In 2008, MoLEP, using reports from its Forest Rangers,

estimated that the area of deforested sloping land was between 300 000 and 350 000 hectares; other sources (e.g. the EU Food Security Office in Pyongyang) had proposed considerably higher figures but without much quantitative evidence. A more reliable estimate may be that of a 2012 study carried out by the EU's Joint Research Centre (JRC)[3]. Using photo-interpretation of points on a digital elevation model superimposed on Google Earth imagery and Bing maps, the JRC concluded that approximately 550 000 hectares of sloping land of gradient > 15^{o} is under cultivation. This figure has been accepted by the CFSAM as being more reliable than any others; the same figure has also substituted the previous estimate of 300 000 hectares in the 2011 (Table 7) in order to facilitate year-on-year comparison.

3.3 Means of production and inputs

The quantity of agricultural inputs provided to farms this year was similar to 2011. However, farms throughout the country reported that the delivery of inputs this year was much more timely than last year, and most regarded this as a major factor contributing to this year's slightly better crop production.

Planting material and plastic sheeting

The dry spell of May-June necessitated frequent re-seeding, especially of maize. However, despite this extra demand for seed, farms generally reported that they were able to re-seed as often as was necessary.

New cereal varieties that are deemed especially suitable to specific agro-ecological zones of the country are regularly released by the National Academy of Agricultural Sciences. Improved breeder seed is then multiplied up by specialized cooperatives and on state seed farms which then provide certified seed on credit to cooperative farms through the Government's distribution system.

New potato planting material in DPRK starts as high-quality virus-free tissue-cultured mini-tubers in the national potato seed centre in Ryanggang, a state-of-the-art facility that has been supported by the International Fund for Agricultural Development (IFAD) and SDC. As with the cereal breeder seed, the mini-tubers then go to specialized seed farms where they are multiplied up to produce high-grade seed for cooperative farms. In the normal course of events however, farms use their own produce as planting material for the next season. This necessitates storage through the winter which often results in considerable loss from freezing and rotting. If the resulting supply of seed potato is inadequate for the farm's requirement the seed potatoes will be divided into several pieces that are often too small to produce a good yield.

Paddy is typically sown in nurseries under plastic sheets at the beginning of April and transplanted in late May or early June. The supply of plastic sheeting this year was better than last year, thanks largely to a successful FAO-MoA initiative.

Fertilizers, manure and lime

Although the total amount of fertilizer applied this year was marginally lower (3 percent) than last year there was an approximately fourfold increase in the application of phosphate (P) and potash (K) (Table 3). This was the highest rate of application of P and K in recent years, and all was reported to have been produced within DPRK. The domestic production of nitrogen (N) fertilizer also increased slightly in 2012 although it was still below the level achieved in 2008. The increase however went some way towards compensating for the 12 percent drop in imported and donated nitrogenous fertilizers. Most farms reported that between 60 and 80 percent of their fertilizer requirements were met this year, which was generally similar to the situation last year. However, the more timely delivery of fertilizer this year was seen as being largely responsible for this year's satisfactory production in spite of the challenging weather events.

[3] 'Assessment of cropland area on sloping land in DPRK' (JRC IES/H04/F/HKE/hke D(2012)(15113)).

Table 3: DPRK - Fertilizer statistics for 2008-2012 (tonnes)

	Year (August to July)	Domestic production	Import/ Assistance	Stocks	Application	Remaining stocks
N (ammonium sulphate equivalent, approx. 20.5% N)	2012	202 931	483 586	3 000	686 517	3 000
	2011	189 335	548 108	1 500	735 943	3 000
	2010	174 350	299 250	3 000	475 100	1 500
	2009	170 090	266 817	900	434 807	3 000
	2008	256 800	181 157	1 400	438 457	900
P (superphosphate equivalent, approx. 17% P2O5)	2012	21 460			21 460	
	2011	5 545			5 545	
	2010	11 402			11 402	
	2009	2 776			2 776	
	2008	7 425			7 425	
K (KCl-muriate of potash, 48-62% K2O)	2012	18 650			18 650	
	2011	4 477			4 477	
	2010	12 314			12 314	
	2009	8 400			8 400	
	2008	10 415			10 415	
Total (N+P+K)	**2012**				**726 627**	
	2011				**745 965**	
	2010				**498 816**	
	2009				**445 983**	
	2008				**456 297**	

Source: Ministry of Agriculture.

The trend of an increasing proportion of P and K application is welcome, especially in view of the absolute increase in N application over the last two years. In 2011, for instance, P and K fertilizers accounted for only 1.3 percent of the total amount of fertilizer applied, whereas this year they accounted for more than 5 percent. Heavy applications of N fertilizers tend to acidify soils, reducing the availability to plants of critical elements such as P and thus compromising crop yields. This is a problem in many parts of DPRK with several farms reporting pH values in the range of 4.5 to 5.5.

However, the problem is not necessarily rectified solely by increasing P and K application. The acidity of the soil must also be reduced, and this is being increasingly achieved by regular applications of lime. Limestone, the source of lime, is abundant in DPRK but the principal constraint to its exploitation has been the shortage of vehicles and fuel to transport lime to farms. This situation has gradually improved in recent years and the application of satisfactory amounts of lime has become much more widespread. The target of most farms is to apply 500 kg of lime per hectare annually.

Several farms reported increased applications of organic manure this year (the target application rate is 20 tonnes/hectare). The contents of organic manure and their proportions vary from location to location depending on what is readily available, but they normally include a well-rotted mix of crop residues, used straw and animal and human waste. An extra bio-active additive to manure was also frequently mentioned this year. Developed by the National Academy of Agricultural Science, this additive is said to contain amino acids derived from the breakdown of animal hair and fur and is reported to enhance soil fertility. In addition, soils that are believed to have a high P content are frequently transported from uncultivated mountainous areas for application on farm fields. Although these are bulky and awkward to transport they are said to boost crop yields.

Crop pest and disease control

Supplies of pesticides appear to have been slightly more satisfactory in 2012 compared to the previous year, with many farms reporting the use of deltamethrin to control pest outbreaks. Nevertheless there is still a lot of room for improvement in the availability of effective phytosanitary control measures, especially in the area of fungicides.

The dry spell in May and June brought with it an increase in the level of soil pests such as cutworms and wireworms, and the subsequent moister conditions saw increased white grub activity. Otherwise, pest and disease levels were not dissimilar to those of previous years. Stemborers were widespread in both paddy and maize, and two newly released paddy varieties, Kang Song no.1 and Pyongyang no.15, appeared to be especially susceptible. The presence of rice water weevil was frequently cited. Minor outbreaks of armyworm in maize were occasionally reported, but control was always achieved with deltamethrin. Sheath blight, bacterial leaf blight and smut were common in paddy at sub-critical levels, as was fusarium wilt in maize.

1 218 tonnes of herbicide comprising ten different commercial preparations were reportedly used this year, but it was not clear how much was used on cooperative farms and how much on state farms.

Integrated pest management (IPM) is widely used with varying degrees of success. Approaches include, among others, light traps, pheromone traps and the use of nicotine and solanin extracted from tobacco and potato leaves respectively.

Farm power

Farm power, in the form of machinery and fuel, is the most frequently cited constraint to increased crop production in DPRK. Farm managers complain that the ubiquitous 28-horse-power Chollima is not sufficiently powerful to plough to the required depth, that it is too slow for the amount of land preparation that needs to be completed in a short space of time, and the numbers of tractors are simply inadequate. This and the limited supply of diesel mean that for many farms, especially those located outside the Rice Bowl, mechanised land preparation can only be carried out on about 60 percent of their arable area, the rest being done by oxen. Inadequate farm power is also a major obstacle to expansion of the area under winter wheat.

The number of tractors in DPRK is reported to have fallen this year by 4 percent since last year (Table 4) while the operational rate per province has remained at between 68 and 74 percent. The fate of the 2 500 or so tractors that have fallen out of use in the last 12 months is not known but it seems likely that they may simply have aged beyond the point of further repair. While most farms depend solely on the standard 28-horse power Chollimas for their mechanization, some farms, especially those in the more productive provinces, have received higher-power tractors from various donors, especially the EU, over the last ten years or so. These tractors have often raised productivity on the recipient farms but their maintenance and access to spare parts are problematic. There has also been in increase in the number of mono-axle tractors as donations in recent years; these are especially suited to the transport of materials to the field and for the cultivation of small or irregularly shaped fields that are awkward for larger tractors.

The amount of diesel used this year was down by more than 3 500 tonnes (about 5 percent) from last year's 68 000 tonnes (Table 5). Nevertheless, farm managers reported that its availability was more timely than last year, meaning that, within the limitations cited above, farm operations could be carried out on time. By the time it is received by the cooperative farms diesel has usually gone through several containers - bulk storage at the national, provincial and county levels, and barrel transport to the farm - with the result that it picks up contaminants en route. Although this is not too serious for the highly tolerant Chollima engines, it can be extremely damaging to the engines of the higher-powered and more sophisticated tractors. The Government now acknowledges this problem and recognises that if the use of higher-powered tractors is to become more widespread it must go hand-in-hand with the provision of cleaner fuel. There is also some recognition that if farm mechanisation is to be increased, a clear policy needs to be formulated with regard to the types of tractor to be used and that access to essential spare parts must be assured.

Tractors were also enlisted this year to pump water from reservoirs, canals, rivers and wells for the irrigation of maize and early crops during the dry spell of May and June. The other source of power for pumping irrigation water was electricity, and farms generally reported that the supply was adequate for their requirements.

Table 4: DPRK - Tractors numbers in 2011 and 2012

Province	2011	2012	% change
Pyongyang 1/	4 016	2 846	-29
South Pyongan	8 035	8 180	2
North Pyongan	9 064	8 763	-3
Chagang	2 064	1 822	-12
South Hwanghae	12 392	12 449	0
North Hwanghae	7 954	7 377	-7
Kangwon	3 558	3 501	-2
South Hamgyong	6 585	6 245	-5
North Hamgyong	4 087	4 190	3
Ryanggang	2 358	2 276	-3
Nampo City	2 875	2 823	-2
Total	**62 988**	**60 472**	**-4**

Source: Ministry of Agriculture.
1/ The large reduction in tractor numbers in Pyongyang between 2011 and 2012 was partly due to a change in administrative boundaries.

Table 5: DPRK - Fuel consumption, 2011 and 2012 (tonnes)

	2011	2012	% change
Petrol	6 800	7 200	6
Diesel	68 000	64 480	-5
Total	**74 800**	**71 680**	**-4**

Source: Ministry of Agriculture.

Irrigation

The major realignment of irrigation canals that was implemented over the past decade and the resulting increase in gravity-fed systems has ensured much more reliable and efficient irrigation of paddy fields. This in turn has released electricity to pump water to the decreasing number of canals that still depend on electrically powered pumping stations. The dry spell at the beginning of the season this year clearly demonstrated this improvement. Paddy was only marginally affected by the dry spell since most fields do not now need pumping for irrigation, and the available electricity was generally sufficient to allow pumping to paddy fields where required.

During the dry spell, the supplementary irrigation of maize and vegetables that would not ordinarily require irrigation was facilitated by the digging and drilling of new wells, the use of tractors to run portable pumps, use of tractors to create sprinkler irrigation, and the mass mobilization of non-farm workers to carry water. Reservoirs suffered during this period; out of a total of 1 700 reservoirs, 210 were reported to have dried up by the end of June, and reservoirs at that time held less than one-third of the target level of 3.5 billion m^3 of available water. However, by late summer national reservoir levels had again exceeded the target.

3.4 Crop yields and production

Area, yield and production figures for 2012/13 are presented in Tables 6 and 7 below. They are based primarily on the MoA's figures, with adjustments being made according to the Mission's observations in the field and following discussions with county officials and farm management staff. As a matter of course, cooperative farms carry out yield estimates by cutting a small sample area of 1 pyong (just over 3 m^2) in each field prior to harvest. Yield is then estimated by extrapolation of the weight of grain from the sample, with adjustment being made to take account of the grain moisture content. In order to ensure unbiased reporting, three observers are involved in this activity - the cooperative farm manager, a county PDS representative, and a CFMC representative. The Mission was able to carry out its own crop-cutting sampling on a number of farms with the assistance of farm staff using their standard methodology; the results obtained were generally very close to the yield estimates reported by the farms.

In examining the MoA's yield and production estimates for this year's main-season crops with a view to possible adjustment, the Mission took into account two factors that it felt could lead to slight deviations from those estimates. The first was the delayed harvesting of some of the maize crop because of the re-seeding necessitated by the dry spell at the beginning of the season. Much of the maize had already been harvested by the time the Mission went to the field, but a significant amount of crop was still standing. Many of these remaining fields were still rather green having been planted late, while others were non-uniform in colour indicating different levels of maturity. For this reason the Mission has reduced the MoA's maize production

estimate uniformly by 1.5 percent. The second factor that the Mission considered might reduce production to below the MoA's estimate was the rainfall in late September and early October. This rain spelt a potential delay in harvesting because of wet fields, and, for those fields that would be harvested last, the possibility of sprouting in the ear with humid conditions if further significant rains were to occur later. The provinces of North and South Pyongan and Chagan were most affected; consequently the MoA's paddy production estimates for these provinces have been reduced by 1 percent. North and South Hamgyong were also affected but to a lesser extent; the MoA's production estimates for those two provinces have therefore been reduced by 0.5 percent.

With regard to the prospects for winter and spring cropping for harvest in the first half of 2013, the Mission reduced the area of wheat and barley from 90 000 to 80 000 hectares in light of the reported shortage of seed.

Main-season crop production for 2012, estimated at 5.031 million tonnes, is almost 6 percent higher than that of 2011, reflecting an increase of 8 percent in average yields. The forecast for the winter and early crops of 2012/13 is for a harvest of more than double that of 2011/12. Overall, taking account of main-season crops, winter and early crops, and production from sloping land and gardens, production is expected to reach 5 801 million tonnes, which represents an increase of more than 10 percent compared with 2011/12 (Table 7).

Paddy

Average paddy yield this year, at 4.76 tonnes/hectare, showed an 11 percent increase on that of last year, which itself was an increase of nearly 2 percent over that of 2010. Even with the slight reduction in the area under paddy this year, production was up by about 8 percent on last year's figure, from 2 477 million tonnes to 2 681 million tonnes. Increased yield and production were mainly attributed to the timely delivery of inputs and, apart from the dry spell, the July flooding and the August cyclone, to the generally favourable weather conditions, especially the higher number of sunshine hours.

Maize

Maize was much more vulnerable to the dry spell than paddy but the huge national effort that was put into irrigating and caring for the young crop appears to have minimized yield reduction and produced a harvest that is almost 10 percent higher than that of 2011. Production for 2012 stands at 2.04 million tonnes compared with 1 857 million tonnes in 2011. Part of this production increase resulted from the 6 percent expansion in area, in addition to a 4 percent increase in yield to 3.48 tonnes/hectare. As with paddy, the timely delivery of inputs and the favourable temperatures and sunshine also contributed significantly to this year's satisfactory result.

Soybeans

Soybean production is down a massive 31 percent compared with last year. In addition to the area decrease explained earlier, it is also be due the yield reduction owing to the difficulty of planting soya in the middle of a seriously dry spell, as was the case in the usual planting month of May.

Early crops 2013 and Double Cropping Programme

The area under early potatoes in 2013 is expected to be similar to that of 2012. If there are no unusual events such as this year's dry spell during the spring and early summer of 2013, it would be reasonable to expect yields of about 2.5 tonnes/hectare (cereal equivalent) and production of 250 000 tonnes. Although this is below the usual target of over 300 000 tonnes, it represents a doubling of this year's production which was so badly affected by the dry spell.

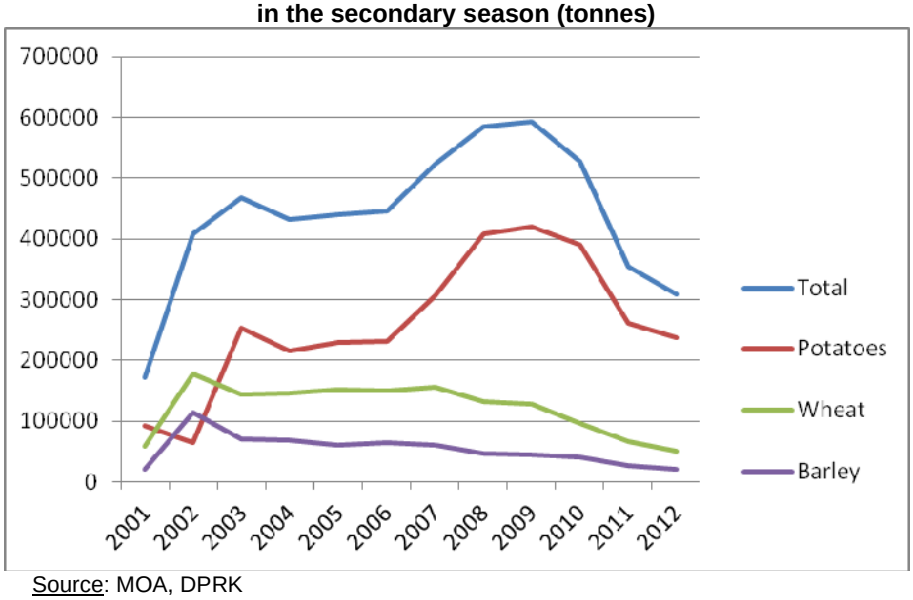
Likewise with wheat and barley, increased production can be expected next summer as long as there are no unusual adverse weather events. Even with reduced area, the result of a shortage of seed, yields of 2 tonnes/hectare and a production of 150 000 tonnes may be anticipated. This represents an increase of 78 percent on the drought-limited production of 2012.

It is interesting, however, to examine the trend of wheat, barley and potato production (both winter and spring) in DPRK over the last two decades (Figure 5). Although wheat and barley production is still encouraged as a means of maximizing agricultural productivity throughout the year, it is clear that the area under these crops has declined significantly since its peak in 2002. Potatoe production has declined since the peak in 2009. The large variation in yield of wheat and barley (e.g. 0.5 tonnes/hectare in 2000, and 2.6

tonnes/hectare in 2009 and 2010) signals an uncertainty concerning the return to what is a fairly considerable investment in terms of diesel, seed, fertilizer and manpower for both land preparation and harvesting. A series of weather-related setbacks along with unfavourable pricing of the commodities relative to maize and paddy in recent years have registered the lowest area and production under these crops since 1990.

Double cropping in general is difficult to achieve successfully if the weather is not conducive or if farm inputs are insufficient. Both of these coincided this year again. When double cropping does go right, then the returns are impressive, but to ensure that the risk of failure or low yields is minimised, farms need to be well resourced and provided with sufficient incentive to work extra hard on the crops. Plastic sheets, for example, are a critically important resource for double cropping; even in a cold spring they can bring paddy or maize seedbeds about three weeks, a period of time that is critical, yet those seedlings do not occupy ground where the preceding crop is maturing or being harvested. Adequate tractor mechanisation and mechanised harvesting are also the only means in the long run of dealing properly with the very tight window between spring crops and main crops in May and June. Oxen and humans on their own are not fast enough. The Chollima tractor barely has the power to cope. Double cropping, however, can provide a good way to incorporate appropriate crop rotations, especially with introduction of other winter crops such as chick peas (a pulse crop) and safflower (an oil seed crop). The conclusion is that the potential for additional food production through careful planning and resource allocation is possible but a holistic strategy of early season cropping should be examined and developed.

Figure 5: DPRK - Double cropping - Annual production of early crops grown mainly in the secondary season (tonnes)



Source: MOA, DPRK

Crop production in home and kitchen gardens

Though limited in size, home gardens can be highly productive, carrying both crops and livestock such as rabbits, pigs, goats and poultry. Supplied as young stock by the cooperative farm to farm households, these contribute significantly to household nutrition and income. A typical pattern of cultivation in home gardens is an early crop of potatoes (cereal equivalent) and green maize, followed by vegetables such as cabbage, peppers, radish, beans and garlic, all mainly for home consumption. It is reasonable to assume yields of 6 tonnes/hectare for maize and potatoes since with close proximity to the house they can be tended with great care. Such production on half of the estimated national home garden area would result in an extra 75 000 tonnes of cereal equivalent. In the absence of firm data, kitchen gardens (which are allocated to institutions and factories) are included in this production estimate.

Table 6: DPRK - Main-season crop area, yield and production of grains and potatoes in 2012, farm production only

Province	Paddy			Maize			Potato (cereal equivalent) 1/			Soybeans			Other cereals			Total		
	Area	Yield	Prodn.	Area	Yield	Prodn.	Area	Yield	Prodn.	Area	Yield	Prodn.	Area	Yield	Prodn.	Area	Yield	Prodn.
	'000 ha	t/ha	'000 t	'000 ha	t/ha	'000 t	'000 ha	t/ha	'000 t	'000 ha	t/ha	'000 t	'000 ha	t/ha	'000 t	'000 ha	t/ha	'000 t
Pyongyang	21	5.2	112	7	4.4	31	0.01	0.6	0.003	1	3.7	2	0.3	3.1	1	29	5.0	146
S. Pyongan	82	5.8	471	60	3.7	222	0.1	2.0	0.2	12	1.3	17	5	1.8	9	159	4.5	719
N. Pyongan	101	4.9	494	89	4.1	368				19	1.5	28	6	2.5	14	215	4.2	904
Chagang	7	5.1	34	35	3.6	127	2	1.6	3	9	1.6	14	1	0.4	0.4	53	3.4	178
S. Hwanghae	142	4.2	598	89	4.1	364				15	1.8	27	4	2.9	10	250	4.0	999
N. Hwanghae	61	5.0	307	82	4.1	334	0.04	1.1	0.04	15	1.4	21	7	2.8	18	164	4.1	681
Kangwon	30	4.0	121	37	3.7	138				7	1.6	12	1	1.3	1	75	3.6	272
S. Hamgyong	63	4.8	303	61	3.9	239	5	1.5	8	16	1.1	19	3	0.7	2	149	3.8	571
N. Hamgyong	27	3.8	103	54	2.9	158	3	1.5	4	14	1.5	21	2	0.8	2	100	2.9	287
Ryanggang	1	3.0	4	8	2.1	16	16	4.2	68	4	0.8	3	1	0.7	1	30	3.0	92
Nampo City	28	4.8	133	9	4.7	43	0.1	6.0	1	3	1.6	5	0.3	1.5	0.5	40	4.5	183
DPRK	**563**	**4.8**	**2 681**	**531**	**3.8**	**2 040**	**26**	**3.2**	**84**	**115**	**1.5**	**168**	**29**	**2.0**	**59**	**1 265**	**4.0**	**5 031**

1/ Potatoes in cereal equivalent at 25 percent conversion rate; Source: MoA.

Table 7: DPRK - Comparison between 2012/13 and 2011/12 (revised) national aggregate production of food crops in cereal equivalent

	2012/13			2011/12 1/			2012/13 over 2011/12		
	Area '000 ha	Yield t/ha	Prodn. '000 t	Area '000 ha	Yield t/ha	Prodn. '000 t	Area %	Yield %	Prodn. %
MAIN SEASON, Farm (Total)	**1 265**	**4.0**	**5 031**	**1 268**	**3.7**	**4 750**	**0**	**8**	**5.9**
Paddy	563	4.8	2 681	571	4.3	2 477	**-1**	**11**	**8.2**
Maize	531	3.8	2 040	503	3.7	1 857	**6**	**4**	**9.9**
Other cereals	29	2.0	59	29	1.7	49	**0**	**19**	**19**
Potatoes	26	3.2	84	34	3.6	121	**-22**	**-12**	**-31**
Soybeans	115	1.5	168	131	1.9	245	**-12**	**-23**	**-31**
EARLY SEASON, Farm (Total)	**185**	**2.6**	**475**	**198**	**1.1**	**224**	**-7**	**127**	**112**
Wheat and barley 2/	80	2.0	160	95	0.7	71	**-16**	**168**	**125**
Potatoes	105	3.0	315	103	1.5	153	**2**	**102**	**106**
NATIONAL, Farm Total	**1 450**	**3.8**	**5 506**	**1 466**	**3.4**	**4 974**	**-1**	**12**	**11**
Sloping land	550	0.4	220	550	0.4	220	**0**	**0**	**0.0**
Household gardens	25	3.0	75	25	3.0	75	**0**	**0**	**0.0**
TOTAL including sloping land and gardens	**2 025**	**2.9**	**5 801**	**2 041**	**2.6**	**5 269**	**-1**	**11**	**10.1**

1/ Includes a small amount of main crop wheat and barley grown mainly in North and South Hamgyong, and Ryanggang.
2/ Revised based on the actual official estimates for the early season crops; Source: MoA and CFSAM.

Crop production on sloping land

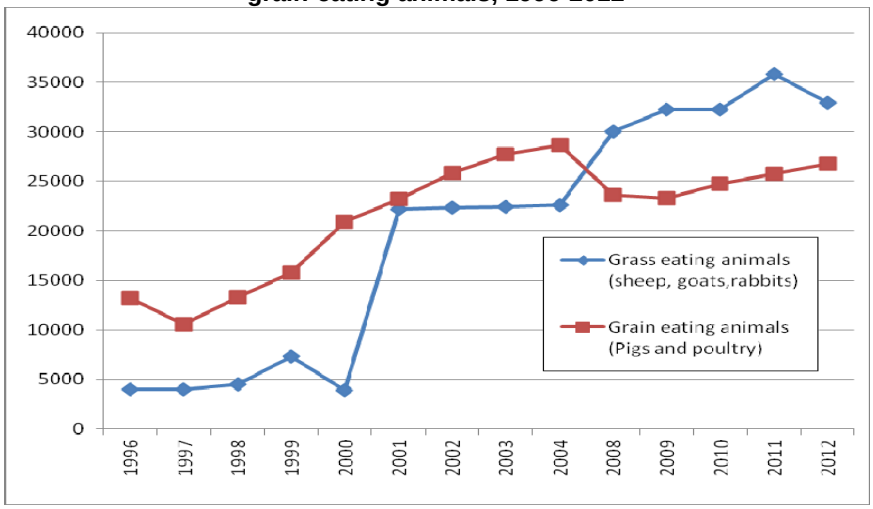
Many factors conspire to suggest very low yield expectations on sloping land. Most sloping-land soils may be assumed to be shallow, of low fertility and subject to accelerated erosion; because of low yield expectations, seed may be of poor quality; and since plots are usually distant from dwellings and cultivators are not necessarily from agricultural backgrounds, crop husbandry may be expected to be relatively poor.

Discussions this year with farm managers on the topic of sloping-land cultivation and productivity were much more open than was previously the case. They suggested that the overall yield figure of 0.5 tonnes/hectare that was used by recent CFSAMs was too high; the lower figure of 0.4 tonnes/hectare has therefore been adopted. In conjunction with the increased estimate of area emanating from the JRC study, this gives a production figure of 220 000 tonnes. This figure is higher than the 150 000 tonnes proposed by the CFSAM of 2011. However, sloping-land production has obviously not changed significantly over the course of the last 12 months and for this reason the last year's estimates have been also revised to reflect the new information and estimates.

3.5 Livestock

In general, there has been an increase in the numbers of livestock since 2000 and more recently since 2009 (Table 8). While cattle numbers have remained fairly static, numbers of goats, rabbits, ducks and geese have increased. Many counties report a policy of increased production of small animals and poultry for distribution to farm households. Pig numbers were deliberately reduced in the mid-2000s because of their high demand on limited grain supplies, but since 2009 the population has grown steadily so that it is once again close to its 2000 level. The stated policy in the country has been to emphasize small ruminants at the expense of large and other grain-eating animals. Judging from the preliminary livestock numbers this trend is evident over several years (see Figure 6). However, there has recently been a resurgence in the number of pigs and after a dramatic increase in the numbers of rabbits from 2001 to 2011, a large decline was recorded in 2012. Animal health is said to be good, although the perennial problem of a shortage of fodder for oxen at the critical time in spring when most work is required of them remains.

Figure 6: DPRK - Numbers ('000) of grass-eating and grain-eating animals, 1996-2012



Source: Ministry of Agriculture.

Table 8: DPRK - Livestock population, 1996-2012 ('000 heads)

	1996	2000	2004	2008	2010	2011	2012	2012 over 1996 (% change)	2012 over 2008 (% change)
Draught cattle	615	579	566	576	577	577	576	-6	0
Sheep	248	185	171	167	166	168	168	-32	1
Goats	712	2 276	2 736	3 441	3 556	3 657	3 689	418	7
Rabbits	3 056	1 475	19 677	26 467	28 571	32 010	29 120	853	10
Pigs	2 674	3 120	3 194	2 178	2 248	2 269	2 857	7	31
Chickens	8 871	14 844	18 729	14 071	14 943	15 843	16 847	90	20
Ducks	1 098	2 078	5 189	5 878	5 936	6 002	5 468	398	-7
Geese	554	889	1 580	1 477	1 626	1 657	1 584	186	7

Source: Ministry of Agriculture.

4. FOOD SUPPLY/DEMAND BALANCE 2012/13

A national food supply/demand balance sheet, including cereals, milled rice and cereal equivalent of potatoes and soybeans, for the marketing year 2012/13 (November/October), is presented in Table 9. In preparing the balance sheet, the following assumptions were made:

a. According to the Government Population Census the total national **population** on 1 October 2008 was 24 052 231. The Department of Statistics uses an annual population rate of growth of 0.6 percent. Using this information, for the purpose of this report, the Mission estimates the mid-marketing year population for November 2012 to October 2013 at 24.7 million.

b. Similar to past CFSAM reports, the annual **per capita consumption** of 174 kg of basic food commodities covering cereals is assumed. The actual breakdown of these is adjusted to match with recent trends in domestic production. Specific food requirements are: 152 kg of cereals (including 60 kg of milled rice, 80 kg of maize, 9 kg of wheat and barley and 3 kg of other cereals), 12 kg of potatoes in cereal equivalent and 10 kg of soybeans. Although the total remains the same this year, the individual items are adjusted somewhat to match with the estimated availability during this marketing year. Specifically, more maize and less potatoes and wheat/barley are included in the planned diet to match with the changes in the crop production this year compared to the previous year. The estimated per capita food requirement of 174 kg is slightly higher than the apparent national consumption average of the previous five years, but is also considerably below the Government's target weighted average consumption rate of 213 kg (milled) per person per year. The Mission's assumed level of consumption on average represents about 1 640 kcal. The remaining energy and other nutrients are assumed to be derived from the limited quantities of available fish, poultry, meat, sweet potatoes, vegetables, fruits and wild foods.

c. Given that **soybean** is the principal source of protein in DPRK, this crop has been added to the food balance sheet beginning in the CFSAM report of 2010. On average the calorie content of soybean is about 20 percent higher than that of cereals[4], hence the production is increased by 20 percent to express it in cereal equivalent terms.

d. Normal year **seed requirement** of 210 000 tonnes is estimated, based on the seed rates used in DPRK, allowing for some multiple planting/sowing and the intended area to be sown next year:

e. **Post-harvest losses,** similar to previous CFSAM reports, of 15 percent for rice, maize and potatoes, 10 percent for wheat, barley and other cereals and 5 percent for soybeans are assumed. Lower losses for winter/spring grains are used because of the normally shorter duration of storage. The level of post-harvest crop losses in DPRK has been a contentious issue in recent years, with estimates ranging from

[4] Calorie content of soybeans varies from 335 kcal to 470 kcal per 100 g depending on the oil content of the beans.

3 percent to more than 30 percent. Unfortunately, no systematic investigation has been undertaken to clarify the issue. The Mission once again recommends that a study be undertaken to quantify losses at each vulnerable stage.

f. The MoA historically estimated animal **feed requirement** at about 120 000 to 150 000 tonnes but reduced this to 75 000 tonnes in 2011/12 given the relative shortage of the staple grains. Given the resurgence in the number of pigs in recent years the Mission decided to use the normal year feed-grain requirement of 120 000 tonnes (consisting of 100 000 tonnes of maize and 20 000 tonnes of potatoes) in the balance sheet.

g. Although reportedly there has been some investment in milling machinery, until clear evidence on the ground is collected, a **paddy-to-rice milling ratio** of 66 percent is used to be consistent with other Southeast Asian countries in the region. No other grains are converted to milled form as the food and non-food requirements are expressed in the whole-grain form.

h. It is difficult to obtain accurate figures on the national **stock** levels. By and large most of the apparent stocks are exhausted by September as the new harvest of maize and potatoes is distributed through the PDCs beginning in October. Given that the stock levels at the time of the Mission were fully exhausted, some stock build-up at the end of the 2012/13 marketing year, equivalent to about two week national food requirements, is assumed.

i. According to the information provided by the Ministry of Food Administration and Procurement, recognizing the projected food deficit, the Government plans to make **commercial imports** of 300 000 tonnes of cereals, including rice, maize and wheat, during the 2012/13 marketing year. The exact composition is not yet determined. Hence these imports are shown under the total cereals column and not by commodity in the food balance sheet. This target compares favourably with the estimated commercial imports of about 300 000 tonnes during 2011/12.

Table 9: DPRK - Food balance sheet for marketing year November 2012/October 2013 ('000 tonnes)

	Rice (milled) 1/	Maize	Wheat and Barley	Other cereals	Potaoes 2/	Soybeans 3/	Total
DOMESTIC AVAILABILITY	**1 769**	**2 285**	**160**	**59**	**449**	**200**	**4 922**
Main-season farm production	1 769	2 040		59	84	200	4 152
Winter/spring production			160		315		475
Production on slopes		220					220
Production from gardens		25			50		75
TOTAL UTILIZATION	**1 859**	**2 526**	**247**	**83**	**449**	**265**	**5 429**
Food use	1 482	1 976	215	74	304	247	4 298
Feed use		100			20		120
Seed requirement	56	62	16	3	65	8	210
Post harvest losses	265	306	16	6	60	10	663
Stock build-up	55	82	0	0	0	0	137
IMPORT REQUIREMENTS	**89**	**241**	**87**	**24**	**0**	**65**	**507**
Anticipated commercial Import							300
Uncovered deficit							207
Of which, food aid on hand or pledged							35

Note: Figures may not add up exactly due to rounding.
1/ Paddy to rice milling rate of 66 percent.
2/ Including potatoes in cereal equivalent at 25 percent conversion rate.
3/ Soybeans cereal equivalent using a factor of 1.2.

The total cereal import requirement in 2012/13 is estimated at 507 000 tonnes. As indicated by various CFSAM reports in the past, since mid-1990s the cereal equivalent import requirement (i.e. the national food deficit), has hovered around 1 million tonnes, reaching over 2 million tonnes in 2000/01, the year of the worst harvest. Last year's Mission estimated the cereal import requirement at 739 000 tonnes. The food gap has narrowed over the years and is now the smallest in recent years primarily due to the improved food crops harvest, but it still remains at a significantly high level.

With a total cereal import requirement of 507 000 tonnes and planned commercial imports of 300 000 tonnes of cereals (mostly maize and some rice), the uncovered deficit is estimated at 207 000 tonnes including 65 000 tonnes of soybeans and the remainder of 142 000 tonnes of cereals.

5. HOUSEHOLD FOOD SECURITY AND VULNERABILITY ANALYSIS

5.1 Household food access

The DPRK has a centrally controlled **public food distribution system** (PDS). 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 them to the entire population. Cereals are distributed through Public Distribution Centres (PDC) and non-cereals such as oils and bean paste are provided through state shops.

The main consumer groups can be divided into cooperative farmers (about 30 percent) and PDS dependents (about 70 percent). This latter category also includes preferential groups such as the public administration, defence and compulsory social security workers, mining, quarrying and construction workers. Of the total production in 2012/13, a total of 1 523 705 tonnes of cereals is planned to be distributed to cooperative farm households, 179 947 tonnes to defence and compulsory social security workers and the remaining 1 735 273 tonnes to PDS dependents.

Cooperative farmers receive an annual average cereal allocation of 219 kg per person per year which equates to a daily cereal ration of 600 grams.[5] Cooperative farmers receive their ration once a year after harvest time and because of this they are generally better protected against food production shocks than PDS dependent households. The actual farm household allocation depends on the age composition of the households and work norms including the number of hours or days worked. The ration composition depends on the commodities produced on the farm or produced locally. Generally a farm household‘s ration consist of about 20 to 50 percent rice and 50 to 80 percent maize or potatoes. It can also include wheat from the winter production or soybean. In addition to cereals, cooperative farmers receive rations of bean paste, cooking oil, salt and soy sauce.

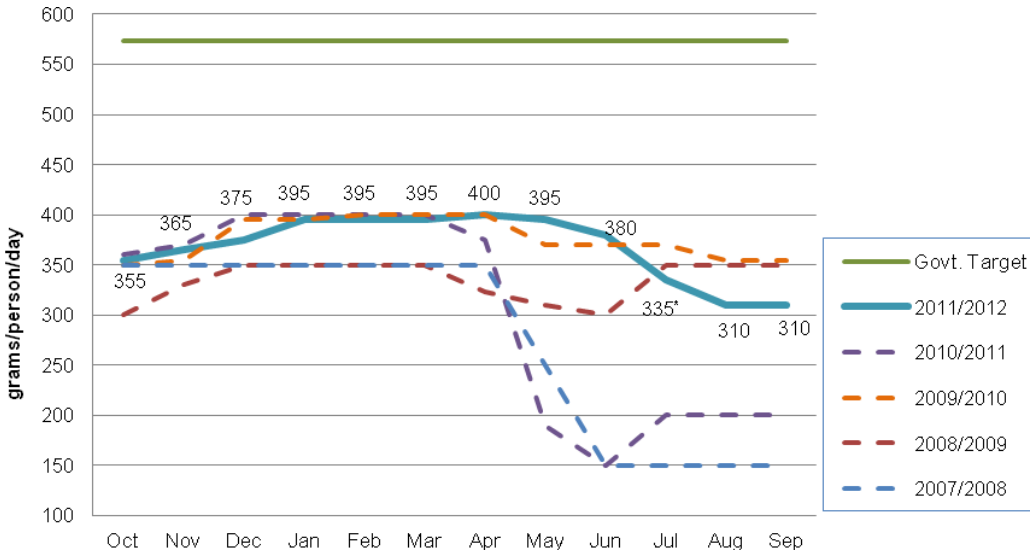
Defence and compulsory social security workers receive priority in the food allocation. Their daily ration size is fixed at 700 grams per person per day. The same ration is also provided to mining, quarrying and construction workers.

The ration size provided to ***PDS dependent households*** varies according to availability. Average PDS rations by month are shown in Figure 7. Thanks to a better supply of grain in the country this year, rations in August and September (towards the end of the marketing year) could be maintained at an average of 310 grams per person per day, providing an equivalent of about 1 100 kcal energy intake. The ration sizes did not dip to the 2007/08 and 2010/11 levels of 150 to 200 grams per person per day despite a failed early season and subsequent impacts of flooding and typhoon winds on the main harvest. That this did not happen was due to timely commercial and bilateral food imports (see section 2.2).However, rations were below those allocated during 2008 to 2010 and substantially below the government target of 573 grams per person per day. They were also almost half of the rations provided to a cooperative farmer. The expectation (and indeed planned allocation) is that following the maize and paddy harvests in October and November, the PDS ration will go back up again to about 400 grams per person per day as it did in previous years. In fact, the planned average monthly allocation per person per day for 2012/13 is October 380 grams, November 390 grams, December to May 400 grams and June to September 390 grams. National production and imports remain however insufficient (food gap is 207 000 tonnes) to meet the government target of 573 grams.

PDS dependent household are entitled to either receive their ration every 15 days or once a month depending on the location. Actual ration sizes received by PDS households vary depending on the household size, age composition and occupation of the husband and wife. These factors make it complicated to exactly determine the reported and received ration sizes at the household level.

[5] Non-cereals including potatoes and soybean are converted into cereal equivalents. For example 4 kg of potatoes equals 1 kg of rice, wheat or maize.

Figure 7: DPRK - PDS average ration sizes, grams per person per day



*) Ration size for July 2012 is shown as an average of 370 grams per person per day allocation in the first half of the month and 300 grams per person per day in the second half of the month.
Source: CFSAM 2012

Although ration sizes are prescribed and are the same throughout the country, the food composition of the PDS rations changes considerably from place to place depending on the type of commodities locally available. The ration compositions encountered by the Mission in the counties visited in the nine provinces generally consisted between 20 to 50 percent of rice, 20 to 70 percent of maize and up to 25 percent in potatoes. In Ryanggang province a large share of the ration was allocated in potatoes and wheat/barley (about 25 percent each). The percentage allocated in soybean was small (zero to 8 percent). As a consequence of the drastic decline in soybean production across the country this share may further reduce in some counties and as such may result in a deterioration of the local diet which, as will be discuss in the next section, is already lacking in fats, oil and proteins.

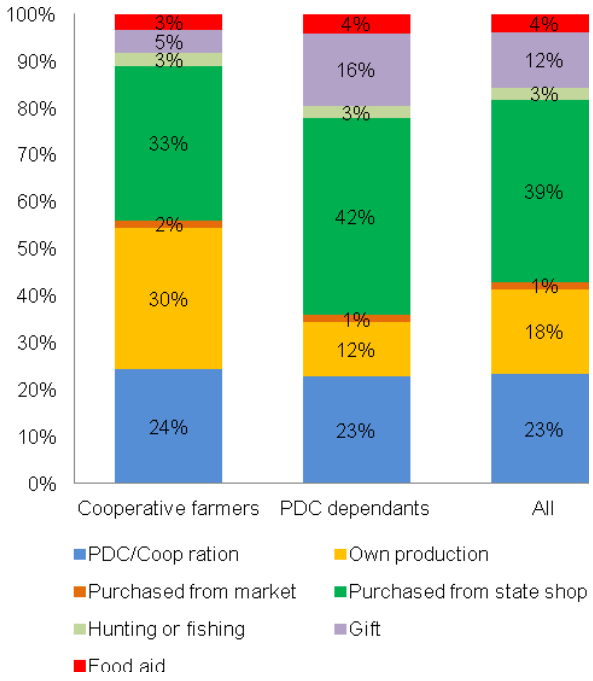
Households interviewed by the Mission had no or negligible stock levels. **Household stocks** are carefully managed to last precisely up to the next PDS distribution date. Most cooperative farm households had also run out of cereal stocks kept from the 2011/12 harvest and were already depending on supplies from the new harvest.

Figure 8 shows the main sources of food for cooperative farmers and PDS dependents. Over 60 percent of all the food households receive is obtained from PDC or from state shops. Own production from kitchen gardens contribute about 30 percent for cooperative farmers and 12 percent for PDS dependents but this depends on the season. Market purchases constitute a minimal source for food.

Reportedly, food grains are almost solely obtained through the PDS system, although interviews with PDS dependent households revealed that a sizeable parallel system of gifts and bartering exists between PDS and cooperative farm households.[6] Data collected by the Mission on this shows that on average PDS dependent households receive about 24 kg of cereals per year through these **informal markets**, mainly from friend and relatives working on cooperative farms, and that these contributions mostly come at a critical time in the year from June to August when PDS rations are at their lowest. Mission findings suggest that almost half of tuber crops consumed by PDS dependents are obtained through bartering or gifting. Bartering is also an important source to acquire beans, fruits, meat, eggs and sugar. The Mission encountered typical bartering terms of for example 1 kg of chicken for 2.5 kg of rice or 3 kg of maize, 5 eggs for 1 kg of maize, 1 kg of fish for 2 kg of maize and 3 to 5 kg of potato.

[6] In the DPRK it is difficult to distinguish between bartering and receiving gifts. Households often refer to gifts when in fact it is a system of giving and re-giving or bartering with a possible time delay.

Figure 8: DPRK - Main food sources, percentage



Source: CFSAM 2012.

Oil is obtained from **state shops** as are bean paste, salt, soy sauce and vinegar. The quantities for these products are rationed and determined by availability. Supply can be a problem and many state shops have limited stocks. The Mission observed that unlike cereal rations, rations sizes for these commodities vary across counties. Current rations for selected products are shown in Table 10.

Table 10: DPRK - Ration sizes for non-cereal foods

	Range (grams per person per day)		
Soy sauce	25	-	35
Bean paste	15	-	25
Salt	12	-	20
Cooking oil	15	-	20
Fresh vegetables	220	-	410
Vinegar	5		

Source: CFSAM 2012.

Salted vegetables such as radish, *kimchi* (pickled Chinese cabbage) and aubergine can be freely purchased from the state shops. Fresh vegetables on the other hand are only available on coupon. Meat is provided by coupon (ration size was not collected by the Mission) and mostly only on special holidays - three times a year. Prices of food items in state shops vary from county to county and are listed in Table 11.

Table 11: DPRK - Prices of food items in State Shops

	Range in observed prices in KPW		
Bean paste (kg)	25	-	28
Soy sauce (lt)	22	-	25
Cooking oil (bottle)	120	-	180
Salt (kg)	2.5	-	3.5
Sugar (kg)	100	-	110
Salted vegetables (kg)	50	-	100
Wild vegetables (kg)	200		

Source: CFSAM 2012.

Household expenditure consists predominantly of food purchased from state shops on subsidized prices, fuel for heating and cooking and outgoings on other daily household necessities. The EMOP review conducted in

July 2012 found that 39 percent of household expenditure is on food, 18 percent on fuel, 13 percent on clothing and the remaining on other items.

Farmers' markets are the main source of food for a very limited number of households. In the provincial capitals there are daily markets. At county level there are farmer markets that are held on the 1st, 11th and 21st day of each month. Food items sold in these markets vary but can include livestock, noodles, bread, biscuits, dry and fresh fish, wild vegetables, dried and fresh vegetables, potatoes, beans and peas and fruits. Food grains are not traded in these markets. The Mission observed an increased number of roadside stalls selling small quantities of biscuits, fruits, drinks and cigarettes.

Prices in markets visited appear much higher than those in state shops (Table 12).

Table 12: DPRK - Prices of food items in farmers' markets

	Range in observed prices in KPW		
Cabbage (kg)	133	-	500
Eggs (piece)	200		
Fish (kg)	2 000	-	3 000
Chicken or Duck (live)	10 000	-	
Rabbit (live)	7 000		
Noodles (kg)	1 000		
Seaweed (kg)	1 000	-	2 000

Source: CFSAM 2012.

Given current prices observed in the market, many food items sold in markets remain out of reach for most in the DPRK.

Home and kitchen gardens are an important secondary source of food for many households. Most cooperative farmers have access to home gardens (more than 90 percent) of about 15 to 30 pyong in size. Cooperative farmers grow almost all vegetables they consume. The EMOP review found that about 69 percent of PDS dependents have access to a kitchen garden. PDS dependents in urban areas are least likely to have ownership of a home garden (between 10 to 20 percent), leaving this group more vulnerable to variation in nationally provided rations for food items through the PDS and state shops. The household survey shows that home gardens of PDS dependants in urban areas are also generally smaller in size (average of 7 pyong) than those in rural areas (about 20 pyong). The EMOP review of July 2012 found that vegetables and potato are the main crops grown in home gardens. These pieces of land are productive and depending on the size of the garden, the Mission found that vegetable production varies between 200 to 1 000 kg per year (mainly of radish and cabbage but pumpkins and chillies are also grown). Nationwide, even in a good production year such as 2009, the country produces about 4.1 million tonnes of vegetables. Its requirements on the other hand are roughly 5.3 million tonnes, a shortfall of 1.2 million tonnes and hence the importance of vegetable production on homesteads (based on data provided by the DRPK government to the Mission).

Besides home gardens, state shops and bartering/gifts, **wild foods** provide another important source for PDS dependent households to acquire vegetables. The April to May spring season is the period when most of the wild foods are gathered.

The majority of households (78 percent according to the EMOP review findings) keep small livestock. They are mostly used for home consumption but are also bartered against cereals. Promotion of non-cereal eating animals, especially rabbits and chicken, is popular. Most are kept by households in rural areas.

About 40 percent of the households interviewed by the Mission, received **WFP food assistance**. This support provided and important source for beans and pulses. Food aid is also a main source for oil for some PDS dependent households. These food items are important sources for proteins and fats which, as we will see in the next section, are lacking in the DPRK diet.

5.2 Household food consumption

Most households report improvement in their food security situation as compared to a year ago. This is predominantly due to a better cereal supply as well as a better pipeline for food assistance provided by WFP.

According to the household survey findings, the per person cereal quantities actual consumed within the household range between 230 and 550 grams per person per day. Cooperative farmers on average have higher daily cereal consumption than PDS dependents (455 grams compared to 318 grams). For most PDS dependent households the daily quantity used is consistent with the amount of cereal reported to be distributed through the PDS as two weekly or monthly rations.

People in the DRPK usually eat three meals a day. A typical breakfast consists of some cereals (either boiled rice mixed with maize, maize porridge, noodles, or potatoes), vegetable soup and *kimchi* or wild vegetables. Lunch is often similar to breakfast. Dinner is simpler and smaller in size and consists of maize noodles and/or boiled rice with *kimchi*. Recall data collected by the Mission on household consumption show that households consume cereals on a daily basis, together with green vegetables or *kimchi.* Condiments, including bean paste, soy sauce and pepper are also consumed on a daily basis by all households. Oils and fats are generally consumed between 4-5 days a week albeit in small quantities. Meat, fish, eggs are on average consumed between 1 to 2 days a week, although meat consumption for the majority is rare and only takes place on special occasions.[7] Dairy products are generally not consumed, while pulses, fruits are occasionally enjoyed, i.e. once a week.

The EMOP review in July 2012 found that 19 percent of the households did not consume any kind of protein source in the past week and 83 percent of the households consumed low diversity diet (consumption of 4 or less food groups the day before the data collection).

Figure 9 shows the macro-nutrient gap derived from a typical DRPK diet as a percentage of requirements. The underlying assumptions for this gap calculation is a daily per person cereal ration of 360 grams (consisting of 20 percent rice, 65 percent maize, 5 percent potato, 5 percent soybean and 5 percent wheat), oil ration of 15 grams and soy paste and sauce of 30 grams each. This typical ration-based diet will fall about 30 percent short of the recommended daily energy intake of 2 100 kcal, is a quarter of the recommended daily protein intake of 50 grams and is almost one third of the recommended daily fat intake of 40 grams.

By giving weights to each food item consumed and taking into account the number of days it was consumed within a period of 7 days, the Food Consumption Score (FSC) was calculated and households classified into three food consumption groups, acceptable, borderline and poor, using standard thresholds.[8] Figure 10 shows the results.

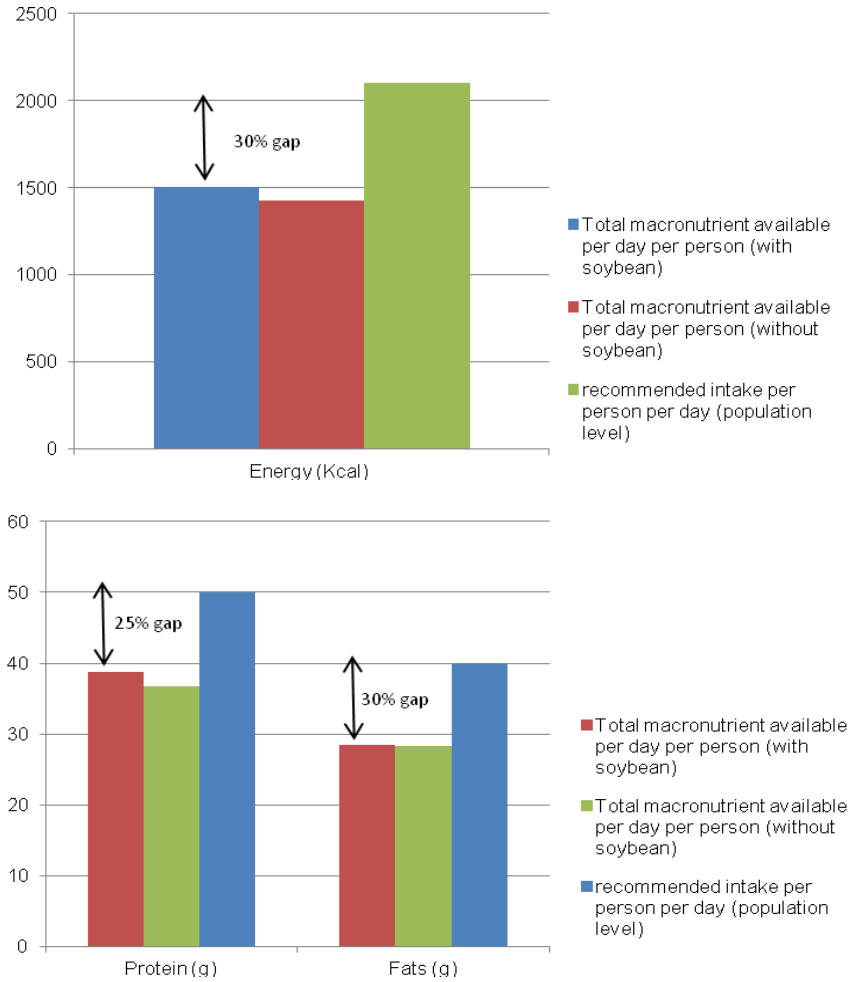
[7] 30 September is one of these occasions. It is a national holiday on which ancestor are commemorated. This may have positively affected the consumption pattern of households interviewed by the Mission during that week.

[8] The FCS is calculated as follows:

$$FCS = 2.(cereals) + 2.(tubers) + 3.(pulses) + 1.(vegetables) + 1.(fruits) + 4.(meat, fish, eggs) + 0.5.(oils\ and\ fats) + 0.5.(sugars),$$

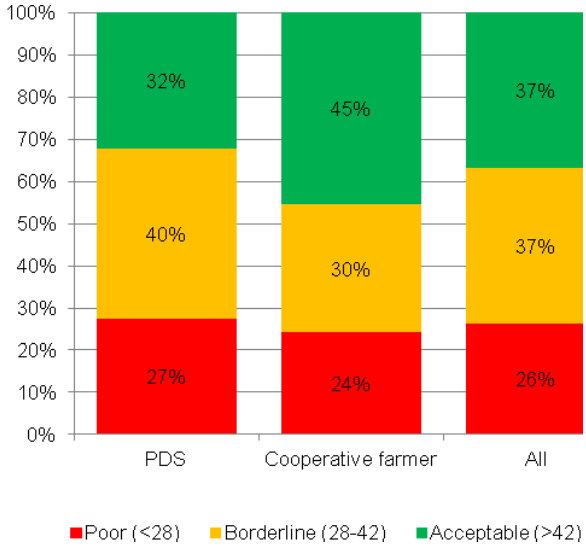
where (…) is the number of days the particular food group was consumed capped at 7 days maximum.
Thresholds used are as follows: poor food consumption households have a FCS less or equal to 28, borderline food consumption households a FCS between 28 and 42, and acceptable food consumption households a FCS equal or more than 42.

Figure 9: DPRK - Carbohydrates, fats and protein content of a typical DPRK diet, gap in recommended daily intake (adult population)



Source: CFSAM 2012.

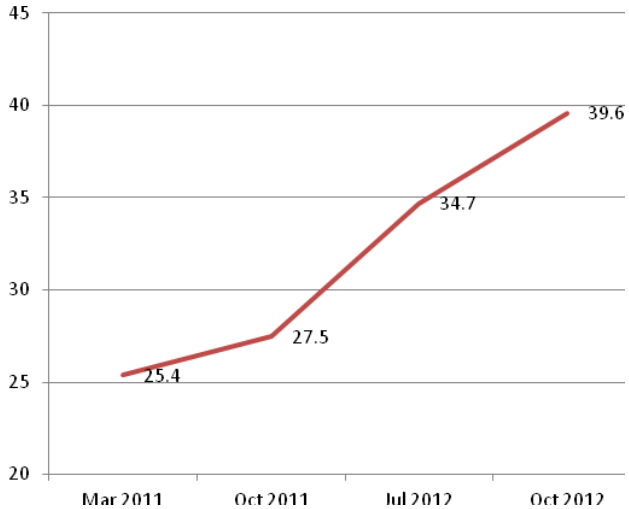
Figure 10: DPRK - Food Consumption Score, percentage of households classified as having poor, borderline or acceptable food consumption



Source: CFSAM 2012.

Thirty-seven percent of households interviewed had an acceptable food consumption. Twenty-six percent were found to have poor food consumption, while the remaining 37 percent have borderline food consumption. In line with the reported improvement in the food consumption pattern due to higher rations sizes and improved food assistance pipeline, the average food consumption score is higher than in the previous year (Figure 11).

Figure 11: DPRK - Average Food Consumption Score
trend of average value of all households



Source: CFSAM 2012, WFP EMOP Review 2012, CFSAM 2011, WFP/FAO/UNICEF RFSA, 2011.

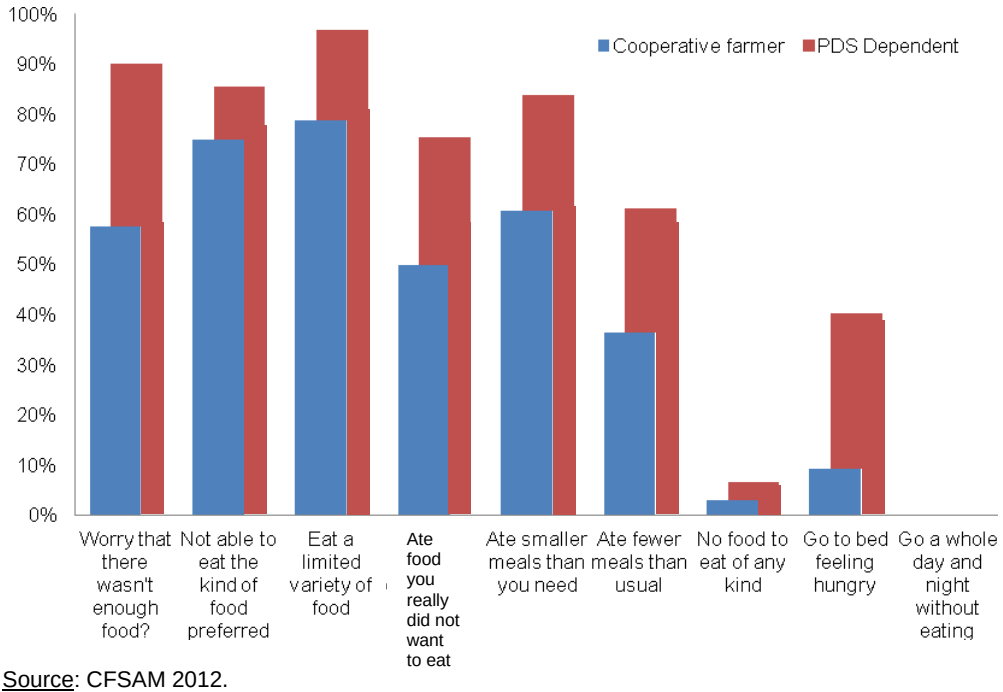
Households with poor food consumption mainly consume cereals and vegetables and were only able to occasionally add oil to their diet. Households consuming a borderline diet do include more regular oil as well as pulses and add once or twice a week fish or meat to the menu. Households with an acceptable diet are able to consume animal-protein rich foods on a regular basis (average of 3 times a week) and oil on a daily basis.

5.3 Strategies for coping with food insecurity

The PDS ration, if equally distributed, ensures a certain level of basic nutrients for all households. However, even if this is the case, it is unfortunately not enough. Apart from the gap analysis presented above, this is evident from the large number of households that report that they often consume smaller meals than they need and of limited variety. More than 90 percent of PDS dependents expressed anxiety about not having enough food to eat. Consuming fewer and smaller meals is a normal occurrence in the DRPK. Fortunately, not eating anything during a whole day is uncommon. Forty percent of PDS dependent household members interviewed reported to go sometimes to bed feeling hungry (Figure 12). The critical period for household food security is from May to September when PDS rations are at their lowest.

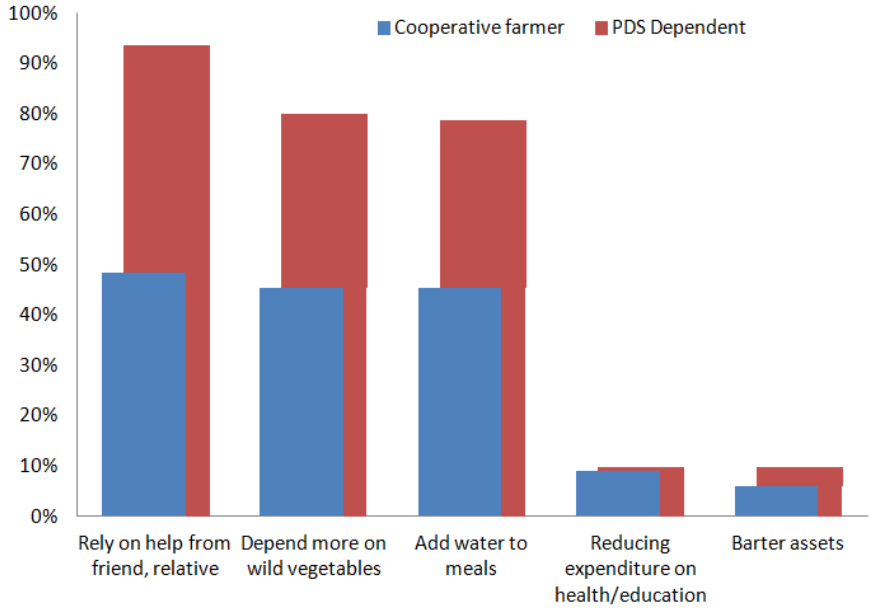
Most PDS dependent households depend on help from relatives and wild foods to get by and supplement their diet. A third, often used, practice is to add water to meals to make them appear more voluminous. Figure 13 shows that more than 80 percent of PDS dependents have used these practices in the past month to a more or lesser extent. Reduction in household expenditure and bartering of household assets are not real options available to a DRPK household. Cooperative farmers also make use of these coping strategies but less frequent.

Figure 12: DPRK - Impacts of food insecurity, percentage of households



Source: CFSAM 2012.

Figure 13: DPRK - Coping with food insecurity, percentage of households



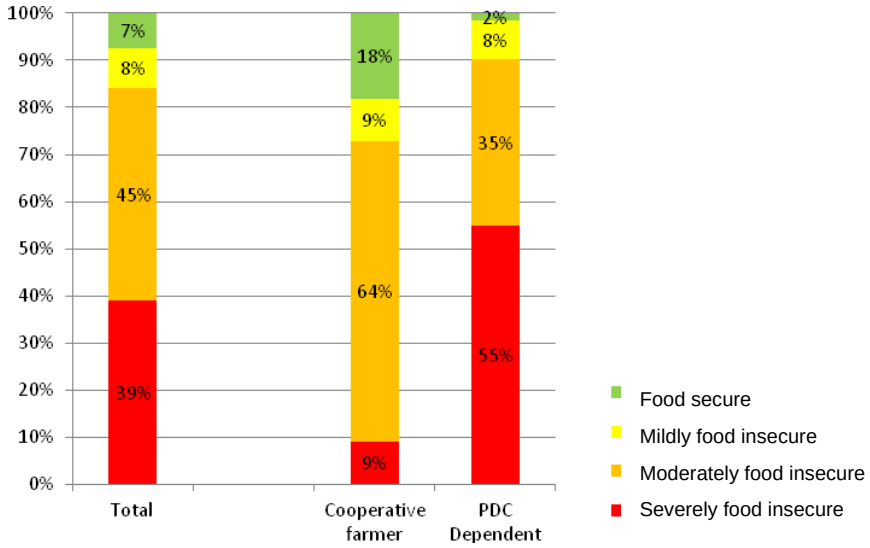
Source: CFSAM 2012.

Further analysis on the state of household food insecurity was done using the FANTA (Food and Nutrition Technical Assistance) Household Food Insecurity Access Scale (HFIAS).[9] This approach uses the responses to the nine questions listed in Figure 12 and classifies them in order of severity. For example, skip an entire day without eating is more severe than reliance on less preferred foods. The HFIAS takes into account and combines the household's anxiety levels about food insecurity, food availability and the quality and variety of food consumption. It subsequently classifies households into four levels of food insecurity:

[9] Details on how to calculate the HFIAS is available in Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide, Jennifer Coates, Anne Swindale, Paula Bilinsky, USAID FANTA, August 2007. This report is available at http://www.fantaproject.org/downloads/pdfs/HFIAS_v3_Aug07.pdf

severely food insecure, moderately food insecure, mildly food insecure and food secure. Figure 14 presents the outcomes.

Figure 14: DPRK - Household food insecurity, percentage of households classified as food secure, mildly, moderately and severely food insecure



Source: CFSAM 2012.

Of the 95 households interviewed by the Mission only a small percentage can truly be classified as food secure (7 percent). They generally don't worry about a shortage of food, have good food supply and according to them sufficient variety. Almost all of these households were cooperative farmers. Eight percent are mildly food insecure. They worry about sufficient food being available and may not always have access to the foods they prefer but do not have to limit meal sizes or eat less quantity. The largest share of the interviewed households is moderately food insecure although more than half of the PDS dependent were classified as severely food insecure. This latter group of households frequently eat smaller and fewer meals than they feel they need and may occasionally go to bed feeling hungry. Notice that a large proportion (64 percent) of cooperative farmers is moderately food insecure. A slight shock disturbing their food access, such as for example production loss from kitchen gardens, can push these households into severe food access problems.

Factors causing household food insecurity have remained largely constant in an environment where households have little flexibility in expanding their food sources and coping strategies. The key factors that influence household food security are:

- The size of the seasonal harvests (main and early crops), the government's ability to import sufficient cereals and the level of bilateral food assistance. These factors determine ration sizes and hence cereal availability at the household level.
- Household's ownership and size of a kitchen garden. This determines the quantity of vegetables and additional cereals (maize and potatoes) a household has access to in addition to the PDS and state shop allocations. It also opens up options for bartering produce. Access to kitchen gardens is most limited in urban areas.
- Household's ownership of small livestock such as rabbits, chickens, ducks and goats. This provides possibilities for consumption of meat and eggs and options for bartering meat for cereals.
- Household's access to natural resources such as fisheries and wild vegetables. This determines the amount of additional foods and in the case of fish to protein sources. Households residing along main rivers and in coastal areas have better access to fisheries, whilst in mountain areas have better access to wild vegetables.
- Household's relationship network. Urban households with relatives on cooperative farms benefit from food support provided by relatives, especially during the lean season.

6. NUTRITIONAL OUTCOMES

6.1 Status of under-nutrition

Child and maternal under-nutrition is caused by a combination of both immediate and underlying causes. Food intake and health status of the individual are the immediate causes. Food insecurity at the household level, along with inadequate caring practices and an unhealthy environment are the underlying causes of under-nutrition.[10]

The Multiple Indicator Cluster Survey (MICS) of 2009 reported a high prevalence of chronic under-nutrition (stunting) at 32.4 percent (height for age z-score below -2 SD) among children under five years of age. There is large variation in stunting across provinces, ranging from 22 in Pyongyang to 45 percent in Ryanggang. In 8 out of the 10 provinces the prevalence of chronic under-nutrition is above the WHO threshold of 30 percent, indicating a serious public health problem. [11] [12] Global Acute Malnutrition (GAM)[13] in DPRK is reported at 5.2 percent, with five out of ten provinces - Kangwon (5.7 percent), Chagang (6.9 percent), North Hamgyong (7.2 percent), South Hamgyong (7.3 percent) and Ryanggang (7.9 percent) - having a prevalence above 5 percent, indicating a poor public health situation.[14] In addition to the 2009 MICS survey, UNICEF, in September to October 2011, conducted a Mid-Upper-Arm-Circumference (MUAC) screening among 180 311 children between the ages of 6 to 59 months in the 4 North-Eastern provinces of North Hamgyong, Ryanggang, South Hamgyong and Kangwon. This survey found that 17.4 percent of children had a MUAC of less than 12.5 cm, defined as acutely malnourished. Concurrently, in November 2011, WFP conducted a random MUAC assessment in collaboration with the Government in the 110 counties where WFP operates (these counties are in all provinces except for Pyongyang, North Pyongan and Chagang). Among the 696 children of 6-59 months screened, the average prevalence of GAM was found to be 14.1 percent (12.5 percent MAM and 1.6 percent SAM). Both these nutrition screening surveys were conducted at the end of the 2011 agricultural lean season when food rations provided had been below an average of 200 grams per person per day for 4 consecutive months. A follow-up MUAC screening survey conducted by UNICEF in February 2012 in the same four North-Eastern provinces found a drastically reduced GAM rate of 5.4 percent. These results are highly associated with seasonal variation in acute malnutrition but it also illustrates the quick improvement in acute malnutrition with food rations back to an average of 350 to 400 grams per person per day from October 2011 onwards. In addition, UNICEF and Save the Children provided nutritional support to severe acute malnourished children in at least 50 Counties.

6.2 Acute under-nutrition

Wasting (being too thin for one's height) is an immediate result of insufficient food consumption and/or illness leading to substantial loss of weight and muscle mass. Children with wasting are at higher risk for growth retardation and mortality. County officials and medical staff from all 27 counties visited by the Mission reported that the nutrition situation had improved from 2011. Anthropometric records at paediatric wards and hospitals suggest that the number of severely acute malnourished children in September 2012 had decreased significantly as compared to those in September 2011. However, estimation of the number of malnourished children based on hospital records need to be carefully interpreted. The number of malnourished children in paediatric wards and hospitals may only include those with complications such as diarrhoea or respiratory tract infections when treatment of the infection is needed (this is the case in counties that implement the Community Management of Acute Malnutrition (CMAM) programme). Children who are moderately acute malnourished are generally not referred to hospitals but treated in nurseries or at home. Another issue is the definition of malnutrition used in DPRK. Across the country, malnutrition is generally classified as degree 2 (moderate) or degree 3 (severe) but criteria may vary from county to county due to the lack of standardized screening criteria. Some counties, particularly those implementing the UNICEF supported CMAM refer to MUAC, weight for height or oedema as screening indicators, while other counties appear to be using weight for age which is not a precise indicator of an acute situation. Others may simply use observation by medical staff.

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[10] UNICEF (2007). Causal framework of Malnutrition. New York: UNICEF.
[11] All provinces have a prevalence rate above 30 percent except for South Hwanghae and Pyongyang.
[12] deOnis, M., and Blossner, M., (1997). WHO Global Database. Geneva: WHO - WHO benchmark indicates prevalence of stunting between 30-39 percent as serious situation.
[13] Global Acute Malnutrition (GAM) includes all children who are moderately wasted (weight for height z-score between -2 and -3) and severely wasted (weight for height z-score below -3 SD). It also includes children with bilateral oedema. GAM can also be defined as MUAC measurement below 12.5 cm. Severe Acute Malnutrition (SAM) is defined as weight for height z-score below -3 SD or MUAC below 11.5 cm.
[14] deOnis, M., and Blossner, M., (1997). WHO Global Database. Geneva: WHO.

Hospitals and nurseries staff mentioned WFP and UNICEF assistance as key contributors to the improved nutritional situation. In September 2011, UNICEF with the Ministry of Health extended the Community Management of Acute Malnutrition (CMAM) programme from 4 pilot counties to 29 counties mainly located in the 4 North-Eastern provinces. The CMAM project focuses mainly on severe acute malnutrition (SAM). Upon identifying cases of severe acute malnutrition without complications such as diarrhoea or pneumonia, mothers or caretakers are provided with antibiotics and a take-home ration of Ready-to-Use Therapeutic Food (RUTF) for children to be treated at home or in the nurseries. In case of SAM with complications, the child will be referred to the hospital to be treated using antibiotics and therapeutic milk (F-75 or F-100) to ensure stabilization of medical complications. Once stabilized, the child will be referred to his/her Ri/Dong clinic to finish the treatment for SAM with RUTF until he or she has achieved the desired weight gain.

The main gaps in responding to acute malnutrition is the lack of support for children who are moderately acute malnourished and the lack of follow-up support to treated SAM children once they have regained weight. UNICEF was able to provide follow up treatment with Ready-to-Use Supplementary Food (RUSF) only to the SAM cases in the 29 CMAM counties while awaiting for the initiation of MAM treatment. Generally, not much more than relying on the normal household or nursery provision of foods is being provided to address the problem. Staff at the hospitals and nurseries may advise parents to provide more meat/fish and 'soft foods' to the malnourished child. This lack of standardized referral and treatment mechanism could potentially increase the risk of moderately malnourished children becoming severely malnourished. There are no specific procedures for these children at the moment but the national guidelines for CMAM is being finalized and it will also include protocols for treatment of MAM children.

Acute malnutrition normally peaks during the period from May to July which corresponds with the rainy season. The main causes of acute malnutrition were reported by medical staff as diarrhoea and indigestion. Although the difference between diarrhoea and indigestion is not clear, this is associated according to them with the consumption of inappropriate or what they called 'hard' foods or drinking of contaminated water. The lack of soap and clean water to wash hands, prepare and cook the food and the lack of proper methods to store different foods could also play an important role. Most acute malnourished children live in urban areas.

With average PDS food rations above the 300 gram per person per day during the lean period this year, and WFP's and UNICEF's assistance, the expectation is that GAM rates have remained stable this year. Data from the national nutrition survey, which is expected to be released by the end of this year, will need to confirm this.

6.3 Chronic under-nutrition

Despite the expected improvement in acute under-nutrition compared to last year, the nutrition status of mothers and children remains worrisome especially due to the chronic lack of proteins, fats and micro-nutrients in the diet. The main sources for protein and fats are from soybean paste and oil which is available from state shops. In some counties soybeans are also provided as part of the PDS cereal ration. Households reported reduction in oil consumption due to the lack of adequate supply in state shops. Current rations of oil and soybean paste at the state shop were reported to be between 10-20 g/person/day and 15-30 g/person/day respectively. It is recommended that at least 17 percent of caloric intake should come from fats, while between 10-12 percent of caloric intake should come from protein. This equals to an average requirement of about 40 g/person/day for oil and 40-50 g/person/day for soybean paste, assuming an energy intake of 2100 Kcal per day.[15] The reported ration of 10-20 g/person/day for oil and 15-30 g/person/day for soybean paste demonstrates the significant gap between the required intake of fats and protein and what is provided (see also Figure 9).[16]

Households indicated daily consumption of vegetables. However, it is well recognized that households lack variety in vegetable consumption. The two main types of vegetables consumed are *kimchi* and radish. Daily consumption of 100g of radish and *kimchi* and 30g of soy sauce would provide very limited amounts of type II nutrients[17] required for growth including potassium, magnesium, zinc and phosphorus. Figure 15 below

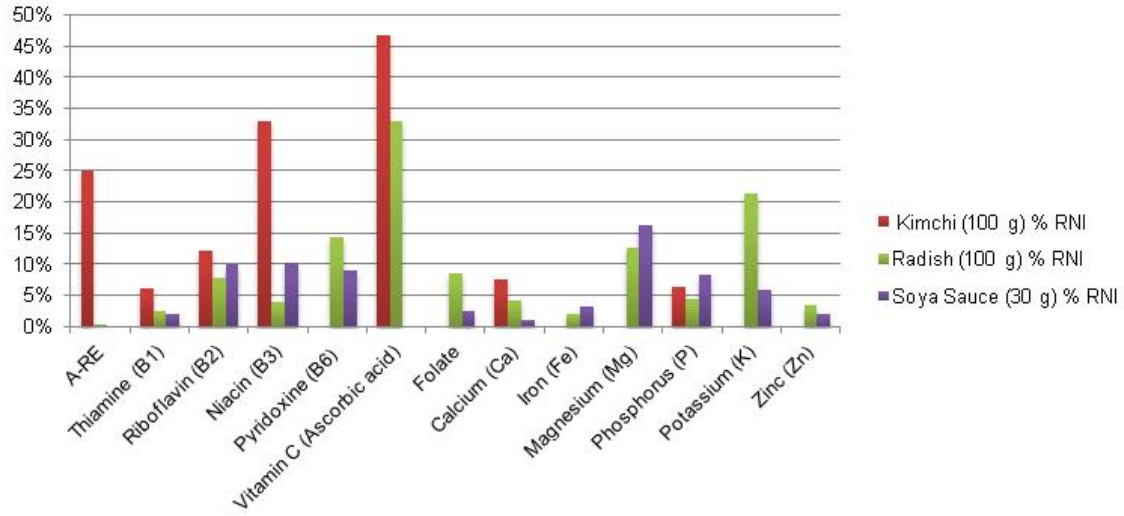
[15] WHO/WFP/UNHCR./UNICEF (2002) Food and Nutrition needs in emergencies.

[16] Boye, J, and Ribereau, S, (201) Assessing compositional differences in soy products and impacts on health claims. Food Research and Development Centre Agriculture and Agri-Food Canada, Canada.

[17] A type I nutrient deficiency is characterized by the apparition of specific physical signs of deficiency as a result of a reduced tissue concentration of the nutrient, which however has no direct effect on growth or body weight. For example, iron deficiency. In contrast, a type II nutrient deficiency is characterized by reduced growth rate or weight loss in the absence of specific deficiency signs. For example, if the diet is deficient in a type II nutrient like zinc, growth stops, followed by weight loss. The concentration of zinc in the major tissues remains normal and there are no deficiency signs.

shows the nutrients value of *kimchi*, radish and soy sauce (per 100 g) expressed in percentage of daily recommended nutrient intake (RNI)[18].

Figure 15: DPRK - Type II nutrients, percentage of daily recommended intake for children under five years



Source: CFSAM 2012.

Available data on the prevalence of micro-nutrient deficiencies in DPRK is very limited. The national nutrition survey will provide data on the prevalence of anaemia in children and women which will update the 1998 and 2004 MICS results which found that 31.7 percent of children aged between 6 to 84 months and 34.7 percent of women of reproductive age were anaemic (Hb < 120 g/dL). [19]

The 2010 National IDD survey showed that iodine deficiency is a national public health concern with 19.5 percent of the assessed children having goiter (representing long-term deficiency) and 51.3 percent having urinary iodine deficiency (representing short-term deficiency). Almost all salt provided at the state-shop is non-iodized and most of the local salt processing factories do not have salt iodization facilities. Both the National IDD survey 2010 and the MICS 2009 showed that less than 25 percent of households in DPRK have access to adequately iodized salt (23.0 percent and 24.5 percent respectively. Most of the adequately iodized salt is found in Pyongyang (32.5 percent). In Ryanggang province, in contrast, only 10.0 percent of households use adequately iodized salt.[20] In an effort to improve the consumption of iodine, UNICEF is supporting two salt iodization factories as well as ensuring the distribution of iodized oil capsules for about 80 000 pregnant and lactating women. However, due to lack of funding and the high cost of iodine oil capsules, this supplementation cannot be regular or sustainable. Iodization of salt would the cheapest and most effective way of improving iodine consumption.

Given a cereal dominated diet lacking in fats, proteins and micro-nutrients, the growth of children to their full potential will remain problematic.

6.4 Maternal under-nutrition and low birth weight

The nutritional status of a woman before and during pregnancy is important for the long-term health of both mother and child.[21] In DPRK, one in four (25.6 percent) women of reproductive age (15-49 years old) have a Mid-Upper-Arm-Circumference (MUAC) below 22.5 cm.[22] Medical staff in one of the maternity wards mentioned that a pregnant women gains on average about 5 kg of weight. This was subsequently confirmed by a number of pregnant women interviewed by the Mission. If correct, this is less than half of the global

[18] This RNI is based on recommended level for children below 5 years of age.
[19] UNICEF/DPRK MoPH (1998). Multiple Indicator Cluster Survey. DPRK.
[20] DPRK MoPH/WHO (2012). Report on Iodine Deficiency Disorders Survey. November 2012.
[21] Black, R.E., *et al*. (2008). Maternal and child under nutrition: global and regional exposures and health consequences. *The Lancet*, Series.
[22] UNICEF/DPRK MoPH (2009). Multiple Indicator Cluster Survey. DPRK

recommended weight gain of 10-15 kg for women of normal weight.[23] This observations needs to be interpreted with caution as many health facilities lack adequate adult weighing scale. Weight at birth is a good indicator not only of a mother's health and nutritional status but also of a newborn's chances for survival, growth, long-term health and psychosocial development. Low birth weight (less than 2 500 grams) carries a range of grave health risks for children. Information gathered during the mission referred to approximately 5 percent of children born with low birth weight, which appears to be in line with the 2009 MICS result of 5.7 percent. Health officials reported the prevalence of low birth weight being reduced from 2011. Whether this is the case is difficult to assess given that many health facilities lack adequate baby weighing scale and hospital records do not include children born at home.

Most of the lactating women interviewed exclusively breastfeed their children for the first 6 months. This is in line with the results of 2009 MICS that found that exclusive breastfeeding is practiced almost universally by 88.6 percent of new mothers.

7. FOOD ASSISTANCE REQUIREMENTS

7.1 Vulnerable areas

The northern and eastern provinces of Ryanggang, Chagang, North Hamgyong, South Hamgyong, and Kangwon rely on food inflows from surplus producing areas in the South of the country (North Hwanghae and South Hwanghae). Many counties in these provinces are food deficit and difficult to reach. The MICS 2009 results show that these provinces also have the highest prevalence rates for underweight and stunted children. Based on these measures of food insecurity, these five provinces can be considered most vulnerable to insecurity in food and nutrition.

North Pyongan, South Pyongan, North Hwanghae and South Hwanghae, and Nampo city are generally food surplus and under nutrition indicators perform relatively better.

To the extent possible, urban areas should be prioritized for food assistance. Most urban people are dependent on PDS rations and have limited or no access to kitchen gardens. In contrast, most rural households have access to a kitchen garden, have a closer connection to farm workers, can keep animals and have better access to wild foods. Urban citizenry are therefore more vulnerable to variations in PDS and state shop rations. As a consequence, urban households are more likely to have low food consumption with higher levels of food insecurity (see Table 13) than rural households. On the other hand, some strategic important urban areas (including Pyongyang, Nampo, Hamhung and Chongjin) may receive priority when supplies become tight. Pyongyang and Nampo municipalities for example are among the most food secure areas in the country as they are major beneficiaries of food transfers from surplus counties. They have low prevalence of malnutrition.

In practice, targeting takes place at the county level and it is difficult to distinguish between ri (rural) and up (urban) areas for targeting purposes. An effort should however be made in targeting the most vulnerable counties. Proxy-indicators (e.g. percentage of PDS dependents, percentage of households with detached houses, arable land available per head) available from the 2008 population census could provide some guidance.

7.2 Vulnerable groups

The PDS to some extent acts as a social protection scheme with even the most vulnerable in DPRK insured of a minimum amount of food. The dependency on the PDS also exposes vulnerabilities.

Cooperative farmers are better protected as far as access to food is concerned. So are preferential groups including people working in defence and compulsory social security, mining, quarrying and construction.

Table 13 indicates which households are more likely to have poor food consumption and high levels of food insecurity. PDS dependents have poorer food consumption patterns than cooperative farmers. Urban dwellers with no access to kitchen gardens also score less than their rural counterparts. Households with pregnant woman have better food consumption patterns as they are allegeable for WFP food assistance and often receive additional food items from relatives and friends during pregnancy and breastfeeding. Despite

[23] Dodd, J, et al., (2011). Limiting weight gain in overweight and obese women during pregnancy to improve health outcomes: the LIMIT randomised controlled trial.

of this they should remain an important target group for food assistance. Without the provided WFP food items (Super Cereal, pulses and vegetable oil) their food security status and food consumption pattern would drop considerably. Larger households on the other hand fare less well. These are households with care for more than one child or for elderly parents. In addition, people with prolonged illness or disability are amongst those most vulnerable. People in these demographic categories may not be able to work (therefore receive lower PDS rations), produce additional food items from kitchen gardens, or gather wild vegetables and foods from forest areas or fish.

Table 13: DPRK - Vulnerable groups, percentage with poor food consumption score or severe food insecurity score (HFIAS)

	Poor FCS (%)	Severe Food Insecurity (HFIAS) (%)
Consumer group		
Cooperative farmer	24	9
PDS dependent	27	55
Location		
Rural (ri)	27	20
Urban (up or dong)	25	55
Household asset		
Kitchen garden	28	24
No kitchen garden	24	59
Household composition		
Pregnant woman (WFP beneficiary)	15	19
No pregnant woman	30	46
Smaller (<4people)	24	36
Larger (>4 people)	35	53
No elderly (60+)	22	40
At least one elderly (60+)	37	37

Source: CFSAM 2012.

Taking into account the identified vulnerable areas and population groups, the Mission estimates a total of 3.5 million vulnerable people. For targeting purposes these can be divided into the following priority groups:

Priority 1 (highly vulnerable): All children in nurseries, kindergarten, primary schools, pregnant and lactating women and elderly (>60) in the North–Eastern provinces. This group also includes all children in orphanages and paediatric wards and hospitals, people with long term illness and disabilities across the country.

Priority 2 (moderately vulnerable): All children in nurseries, kindergarten, primary schools, pregnant and lactating women and elderly (>60) in the urban areas in the South-Western Provinces excluding Pyongyang and Nampo municipalities.

Details are provided in Table 14.

Table 14: DPRK - Number of vulnerable people ('000)

		Total Population	Pregnant/ Lactating women	Children under the age of 5	Children in kindergarten (age 5-6)	Children in primary schools (age 7-10)	Elderly (age 60+)	Total vulnerable population
Priority 1 VG in N/E	Ryanggang	736	23	52	21	46	101	243
	North Hamgyong	2 109	63	151	59	127	290	690
	South Hamgyong	2 995	89	218	87	183	418	995
	Kangwon	1 073	33	74	29	61	138	335
	Chagang	1 327	38	93	39	82	210	462
Special groups	Orphans							12
	TB patients							52
	Disabled							22
	Pediatric wards							11
Total highly vulnerable		8 240	246	588	235	499	1 157	2 822
Priority 2 VG in urban areas in S/W)	South Pyongan	624	19	45	18	35	83	200
	North Pyongan	591	18	40	16	32	87	193
	South Hwanghae	573	17	37	15	33	83	185
	North Hwanghae	579	17	42	16	34	78	187
Total moderately vulnerable		2 367	71	164	65	134	331	765
TOTAL vulnerable population		10 607	317	752	300	633	1 488	3 587

Source: CFSAM 2012.

Given that the diet is lacking in fats and proteins compounded by the widespread problem of chronic malnutrition amongst children under the age of five, the Mission recommends the provision of a mixed nutritious food basket targeted to the highly vulnerable in the five North Eastern Provinces.

8. RECOMMENDATIONS FOR FOLLOW-UP ACTIONS

8.1 Recommendations related to agriculture

There are several issues relating to crop production, post-harvest technologies, human nutrition and farm mechanization that are important to improve production and food security in DPRK, but the Mission would like to highlight the following four, which are considered particularly critical this year. In order to improve food security in the short to medium term, the Mission also makes recommendations for national and international support for:

a. **Production of protein commodities such as soybean and fish:** A typical diet in DPRK is low in protein and for this reason a rapid increase in production of pulse crops such as soybeans, peas, chickpeas, lentils and other beans is urgently needed. Currently, the national production of soybeans is highly inadequate. Lessons from the 1990s soybean campaign should provide basis for the renewed strategy. Similarly, another important source of protein is fish. Fish protein is of very high quality and contains sufficient amounts of the essential amino acids required for healthy body. Fish ponds on cooperative farms in some years yield very well, producing up to 5 tonnes/hectare of fish per annum. However, recurring floods have destroyed many fish ponds on cooperative farms and require urgent rehabilitation and further development. Given these facts, the Mission recommends

national and international support to increase production of these protein commodities or facilitate imports in the short run.

b. **Revitalization of the double cropping programme:** As shown in this report, production of early season crops - wheat, barley and potatoes, has been declining over last several years, after having reached peaks with international donor and FAO support. Although the early season is more prone to extreme weather conditions, there are many factors responsible for this decline or stagnation of double cropping. Series of weather related setbacks have decimated good quality seed supplies. Shortages of other key inputs such as fertilizer, plastic sheets, fuel, spare parts, etc. have contributed. Long term decline in mechanization has put added pressure on the limited labour during the critical period of farm operations (typically April to July). Lack of sufficient incentives for this additional work and productivity also plays a significant part. Given that the use of productive land for a second season crops presents an excellent opportunity including possibility of introduction of other winter/spring crops for appropriate crop rotation, the Mission recommends a thorough examination of the entire strategy and its costs and benefits, to promote double cropping. The aim should be to overcome the input constraints, mechanization limits and inadequacy of the incentive system. For the current marketing year, urgent provision of quality seeds for winter wheat (to be planted in October-November), spring barley and spring potatoes (to be planted in March) along with fertilizer and plastic sheets is recommended.

c. **General assistance for household garden production:** It is evident that farm households put a great deal of effort into production of both food crops and small livestock on their own private holdings of approximately 30 pyong (about 100 square metres). The produce from these holdings benefits not only the producers themselves but also finds its way to urban-dwelling relatives. Improvements in productivity could therefore benefit a very large section of the population improving food security in general. The Mission therefore recommends that national policy be developed and its implementation supported. Various elements of immediate support could include the provision of quality seeds, fertilizer, pesticides, and technical training for those lagging in productivity.

d. In the medium to longer term, the Mission recommends the **adoption of an incentive system** through relevant changes in agricultural marketing to help elevate production and improve the country's food security.

8.2 Recommendations related to household food security and nutrition

Despite loss of early crop and subsequent impact on the main crop due to inclement weather, household food security showed improvement from last year due to timely food imports and a more stable food assistance pipeline. This helped stabilize the nutrition situation during the 2012 lean season. However, the food economy of the DPRK remains vulnerable with limited capacity to absorb production shocks. Most at risk are PDS dependents without access to kitchen gardens or relatives on cooperative farms, young children, pregnant and lactating women and elderly and disabled residents.

The Mission makes recommendations for the following key areas:

a. **Prevention of chronic malnutrition**: Chronic under-nutrition represents a major obstacle to future growth and productivity in DPRK. The Government, UNICEF and WFP should work together to develop a strategy to address stunting in the DPRK.

b. **Prevention of acute malnutrition remains important:** This can be achieved by providing nutritious meals for all children attending child institutions including baby homes, nurseries, child centres, kindergartens, boarding schools and primary schools. In addition, children admitted to paediatric wards need to be provided with nutritious meals to help recovery from illness and prevent them from becoming malnourished. They could also be provided with take home rations of Super Cereal for one month or more to further promote full recovery. Furthermore, the presence of the CMAM project in 25 counties coupled with the distribution of fortified blended foods has proven effective in reducing malnutrition. The treatment protocols for SAM are in place but they should be broadened to include treatment of moderate acute malnutrition to prevent children (and pregnant/lactating women) from becoming severely malnourished. The CMAM programme should be implemented by the Ministry of Health, in close partnership with the Child Nutrition Institute, UNICEF and WFP.

c. **Pregnant and lactating women should continue to receive priority in receiving food assistance:** Assistance to pregnant and lactating women with fortified blended foods to enhance their nutritional status during pregnancy and the period of breastfeeding should continue. A Food-for-Training approach could be implemented with a focus on health and nutrition topics related to pregnancy, breast-feeding, child feeding and caring practices. For those pregnant and lactating women who are malnourished, as evidenced by low MUAC, a special programme should be implemented and Super Cereal provided to assist in guaranteeing the intake of essential micro- and macro-nutrients as well as minimize the risk of low-birth weight children.

d. **Hidden hunger and the gap in micro and macro-nutrients:** The continued lack of protein, oils and fats in the daily diet of the vulnerable population remains a concern and warrants particular attention. The lack of these key food groups is compounded by the projected shortfall of oil available to PDS-dependent households resulting from the poor soybean harvest. Daily consumption of vegetables such as kimchi and radish falls short in providing the essential minerals and vitamins. In this context, international assistance should be considered to provide the additional fortified blended foods (Super Cereal), oil and pulses to pregnant and lactating women**.** Attention should also be given to the general introduction of iodized salt.

e. **Disaster preparedness and response programmes:** Recurring natural disasters and weather-related events are not likely to abate in the coming years. With the help of international community, the Government should assist county officials in the design and implementation of disaster-preparedness measures that aim to protect agricultural lands and home gardens (for instance flood embankments and drainage systems). Small-scale food-for-community development projects could be implemented as a means to address disaster preparedness priorities.