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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Mission Highlights

- In DPRK, including the estimates for the 2010 main season harvest and forecast for the 2011 early season crops, a total of 5.33 million tonnes of staple food production from the cooperative farms, individual plots on sloping land and household gardens for 2010/11 is expected. This is about 3 percent higher than in 2009/10. When paddy is converted to milled rice, the above total production comes to 4.48 million tonnes.
- A substantial increase in production was expected due to some improvements in the availability of fertilizer, pesticides, operational tractors, diesel and electricity. This expectation, however, was frustrated by some adverse weather events.
- The winter of 2009/10 was unusually severe and prolonged which resulted in a low survival rate of winter wheat and delays in planting of spring crops and transplanting of main season paddy. Also, unusually intense rainstorms hit most of the country in late August and early September, causing localised flooding, crop loss and structural damage to irrigation canals and dams.
- Despite the relatively good harvest, based on the Mission's estimate of total utilization needs of 5.35 million tonnes of cereal equivalent (rice in milled terms), there is an import requirement of 867 000 tonnes for the 2010/11 marketing year (November/October).
- According to the Ministry of Agriculture, 325 000 tonnes of commercial imports are planned for the upcoming marketing year. This seems to be in line with the commercial imports during the previous year. Thus, the Mission estimates an uncovered food deficit of 542 000 tonnes for the 2010/11 marketing year.
- In 2009/10 a large number of low income non-farming households faced a significant food consumption gap as the cereals received from the public distribution system (PDS) provided only about half the daily caloric requirement on average. The deficit was unlikely to have been fully covered by other foods due to low purchasing power of these households.
- Despite the overall large deficit in the food supply, food supplementation for children and women plus the child survival programmes in place have contributed to reduced rates of malnutrion.
- Given that the overall food production situation in 2010/11 is not expected to improve significantly, the Mission recommends the provision of international food assistance to about 5 million most vulnerable people (including groups with special needs such as children, pregnant and lactating women and the elderly with no support and PDS dependent populations in high malnutrition and mountainous regions), amounting to 305 000 tonnes of cereals.
- The planned commercial imports and recommended food assistance do not fill the entire uncovered food deficit leaving a gap of 237 000 tonnes of cereals. The Mission highlights the importance of meeting this gap to ensure adequate food is available. Should the Government not have the capacity to meet the gap through additional imports, these efforts can be supported by the international agencies and bilateral donors.
- Furthermore, efforts should be made to provide soybeans and other pulses as part of the food assistance to increase the nutritive content of the diet.
- In order to improve food security in the short to medium term, the Mission also makes recommendations for national and international support for - (i) potato storage and grain drying facilities to reduce losses and improve food safety, (ii) improvement in production of protein rich commodities such as pulses and fish (from aquaculture), and (iii) general assistance to private household garden production.

1. OVERVIEW

An FAO/WFP Crop and Food Security Assessment Mission (CFSAM) visited DPRK at the request of the Government from 21 September to 2 October to assess the 2010 main-crop harvest, to forecast the 2011 production of winter and spring crops, and to estimate cereal import requirements for the 2010/11 marketing year (November/October), including food assistance needs.

Of the country's ten provinces, the Mission visited the seven that normally account for about 90 percent of the nation's cereal production. These provinces include North Pyongan, South Pyongan, North Hwanghae, South Hwanghae, North Hamgyong, South Hamgyong and Kangwon. The Government provided the Mission with official crop area and production figures and other relevant information. The Mission reviewed and where necessary, adjusted the estimates in a 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. The Mission also visited rural and urban households in all the selected provinces,

schools, nurseries, hospitals, Public Distribution Centres (PDCs) and some county grain storage facilities. Discussions were held with staff of UN agencies, EU Project Support Units, resident diplomatic missions, NGOs and Government officials at national, provincial and county levels.

With the prospect of an improved input-supply situation for the 2009/10 cropping season the Ministry of Agriculture had initially anticipated a significant increase in crop production compared with 2008/09. Unfortunately, weather conditions almost cancelled out the benefits accruing from the greater availability of inputs, so that production in 2010 showed only a marginal improvement over 2009. The winter of 2009/10 was unusually cold, with the result that the survival rate of the winter wheat was often as low as 60 percent. The winter was also unusually prolonged, causing delays of up to three weeks in spring sowing and main season transplanting. In late May, much of the country experienced torrential rains which led to some serious local flooding. After about three months of favourably warm weather, the country was again hit by rainstorms at the end of August and the beginning of September. The results were further localised temporary flooding and damage to crops, especially maize at the time when it should have been drying off for harvest. The Yalu River burst its banks and inundated much of the land around Sinuiju area. Several areas elsewhere, especially on the east coast, were similarly affected. The overall effects of these were seen in the poor quality and high moisture content of some of the maize that was harvested in late September as well as in some paddy. By the end of September, large areas of paddy fields were still wet.

On the inputs side, the availability of seed, fertilizer, pesticide and herbicide continues to be a problem but there was some improvement this year as compared to last year. Similarly, the level of farm mechanization is extremely low but this year more tractors were operational and the supply of diesel was less limiting than in previous years. Apart from facilitating land preparation, the enhanced diesel supply meant that more lime and fertilizer could be transported to the farms and that rehabilitation work following adverse weather events could be more swiftly carried out. The supply of electricity, important for irrigation on those farms that depend on pumps, was reported as being generally better this year.

There has been a slight increase in DPRK's cropped area this year with the gradual expansion of double-cropping. Winter wheat, however, is rapidly giving way to early potato as the potato yield is usually superior and there is often a low survival rate of winter wheat. Storage of seed potato, however, remains a problem, with high losses over the winter months.

A potentially very damaging plant hopper returned to infest paddy after an absence of about 40 years. It was, however, adequately controlled this year.

For 2010 the Mission estimates an increase of about 4 percent in paddy production and a marginal drop in maize production over the 2009 harvest. The area under soybeans has expanded very considerably this year, but with lower yields, production is only slightly higher than last year. Including the forecast harvest of the 2011 early season crops, a total of 5.33 million tonnes of staple food (including paddy, other cereals, soybeans and potatoes in cereal equivalent) production from the cooperative farms, individual plots on sloping lands and household kitchen gardens for 2010/11 is expected. This would be about 163 000 tonnes or 3 percent higher than in 2009/10. After converting paddy to milled rice and taking total utilization needs for the year, an import requirement of 867 000 tonnes of cereals, more-or-less similar to the historical structural deficit of the country, is estimated.

The Government Public Distribution System (PDS) provides cereals to the population across the country and makes adjustments each month to ensure that the cereal available at the national level stretches to the next harvest. In 2009/10, cereal rations distributed to non-farming households represented on the average 65 percent of the target ration, providing about 50 percent of the energy requirement.

During the Mission, it was evident that there were no cereals in stock in the warehouses visited. Maize available for distribution in October was from the current harvest. Due to inadequate drying facilities, the maize had very high moisture content and contaminants and was of low quality.

The overall cereal deficit in the 2010/11 marketing year (November/October) is similar to previous years. It is therefore expected that households will continue to receive cereal rations from the PDS that are much below their needs and thus under-nourishment will continue for the majority of the population unless the full gap is closed by commercial imports/food assistance. This continued large consumption gap is a major concern and cannot be sustained over the years. Any small shock in the future could trigger a severe impact and would be difficult to contain if these chronic deficits are not effectively managed.

In addition to food assistance, the Mission also recommends national and international support for specific key agricultural sector areas to help improve food security in the short and medium term.

2. OVERALL ECONOMIC SETTING AND AGRICULTURE IN DPRK

2.1 Macroeconomy[1]

In past years the DPRK economy has been growing at a sluggish pace with a large year to year fluctuation. The recovery that began in 1999 enjoyed modest growth in the country's real GDP until 2005; unfortunately this was followed by a negative growth in three out of the past four years (see Table 1). Overall, there has been about 7 percent growth in the past seven years implying a simple average of a 1 percent year-on-year increase in real GDP. However, with a population growth of about 0.6 percent per annum, per capita real GDP is virtually stagnant. Given that agriculture is the main contributor to the national income, volatility in agricultural production is a major challenge in maintaining stable and improving living standards for the population.

Judging from the statistics the total trade deficit has been rising alarmingly; it went up from a low of USD 983 million in 2003 to an estimated record high of USD 1.53 billion in 2008 (see Table 1). Due to the generally lower trade activities during 2009, both exports and imports are expected to decline. The Republic of Korea (ROK) is DPRK's top export destination taking about half of the North's total exports. EIU forecasts a drop in these exports in 2010 following the strained economic ties between the two countries. The most important source of imports for DPRK is China, making it also the largest trading partner, followed by ROK. Trade remains a potential source of growth and economic improvement.

Table 1: DPRK - Key Economic Indicators, 2003-2009

	2003	2004	2005	2006	2007	2008	2009
Real GDP growth (%)	1.8	2.2	3.8	-1.1	-2.3	3.7	-0.9
Real GDP Index (2002=100)	102	104	108	107	104	108	107
Exports (USD million)	1 066	1 278	1 338	1 467	1 685	2 045	2 000
Growth in exports (%)	--	19.9	4.7	9.6	14.9	21.4	-2.2
Imports (USD million)	2 049	2279	2 713	2 879	3 083	3 578	3 100
Growth in imports (%)	--	11.2	19.0	6.1	7.1	16.1	-13.4
Trade deficit (USD million)	983	1001	1 375	1 412	1 398	1 533	1 100

Source: Economist Intelligence Unit, August 2010 Country Report and earlier issues.

2.2 Economic policy changes

There has been an important market reform since 2003 when farmers' markets were officially recognised and allowed to operate in the country for the first time. In addition to vegetables, potatoes and green maize from kitchen gardens, a variety of consumer goods are sold in these markets. Farmers' markets convene three times each month. 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. Several consumer markets, where food and non-food items are marketed operate in the country. The 2008 CFSAM reported that market liberalization seemed to be apparent. However, this seems to have slowed down in the past year.

On 30 November 2009 the Government announced a drastic new policy of redenomination of the national currency. Under this policy the population was required to turn in the old won bills for the new ones. But, with a cap of 100 000 North Korean Won (KPW) per family, anyone with excess amount would receive one new won for 100 old wons, thus basically wiping out much of the private savings and wealth[2]. The purpose of such a policy may have been to control the persistent inflation by reducing the money supply in the economy and also to curb the growth of the market economy and private enterprise profit making. The salaries remained the same, but prices were reduced significantly. For example, PDS prices of rice went down from KPW 44 to KPW 24 per kg and maize from KPW 24 to KPW 14. The new procurement price of paddy from

[1] Based on EIU and Bank of Korea, Seoul publications.
[2] Source: Peterson Institute for International Economics, Policy Brief, Number PB10-1 (page 6), January 2010.

cooperative farms is set at KPW 29 000/tonne whereas it used to be KPW 42 000 before. The value of the "new currency" did not change significantly with respect to the foreign currencies. For example, the official exchange rate with US dollar changed only slightly, going from KPW 140 to KPW 135 per USD from 30 November to 1 December 2009. Since then the won has further devalued as it currently stands at about KPW 100 to USD 1.

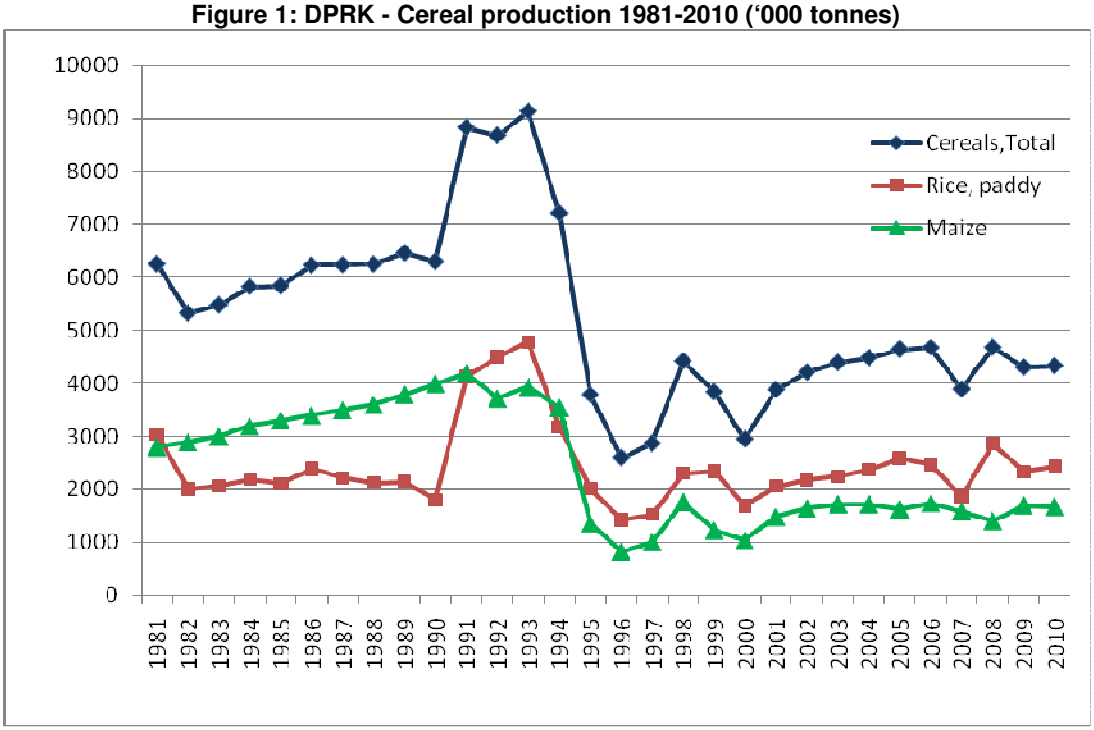
The short term food security implications of this policy change seem to be positive for the low-income households which did not have savings of more than KPW 100 000. The purchasing power of this group was increased since the prices of the basic commodities were reduced. However, the impact on prices in the open markets reportedly has been quite the opposite. For example, in *Tongil* Market (the open market in Pyongyang) currently a kilo of rice can be purchased at an enormous price of over KPW 1 000 which compares with a normal price of just KPW 24 in the PDCs. Longer term impacts of this wealth redistribution policy are not yet clear but are likely to discourage private savings, investments and market oriented activities resulting in a negative impact on economic growth.

2.3 Agricultural sector

Agriculture, including forestry and fisheries, is the main contributor to the national income; however, its contribution to the GDP has declined from about 30 percent in the early 2000s to some 21 percent in 2009. The performance of this 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 and 2007 (see Figure 1). Years 2009 and 2010 do not seem to show much improvement. It is clear from the graph, the total cereal production has stagnated under the plateau at around 4.5 million tonnes. Major challenges remain to reach the potential of about 6 million tonnes experienced in the 1980s.

The precarious foreign exchange situation has not allowed significant commercial imports of much needed agricultural inputs such as fertilizer, pesticides, plastic sheeting, spare parts for machinery, tyres for tractors and trucks, fuel, etc. Over the years, domestic production of fertilizer has declined to a level of about 10 percent of total requirement, increasing dependence on fertilizer imports and reducing its use. Much needed lime application to improve fertility of acidic soils is severely constrained by the lack of transport facilities and fuel availability. Yields of the main paddy crop used to be around 7 or 8 tonnes/ha during the 1980s, but now they are about half of that, due to 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, is being brought under production unofficially by individuals. Although the Ministry of Land and Environmental Protection (MoLEP) has devised regulation of sloping lands and re-forestation, the rehabilitation and renewal progress has been slow. Cultivation of marginal lands has unintended consequences of soil erosion and further reduction in overall land productivity. Thus productivity improvement is desperately needed. Double cropping of wheat and barley after rice and maize (cereal after cereal) on already exhausted soils is non-sustainable and with the existing level of mechanization seems to have reached its limits. Introduction of leguminous crops in the crop rotation and potatoes is vital. Emphasis on pulse crops would also help improve the protein content of the national diet.

Figure 1: DPRK - Cereal production 1981-2010 ('000 tonnes)



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 to 73 percent this year, up from 72 percent in 2009 and 57 percent in 2004. The major constraint seems to be the shortage of spare parts, tyres and fuel.

The agricultural marketing system is tightly controlled as all cereals and soybean output of the cooperative farms must be sold to the State. The prices offered to cooperative farms seem to be attractive, however, the net income of farmers may not. The net income of a farm depends on the productivity of the farm and the cost of all inputs (seed, fertilizer, pesticide, fuel, etc.). Access to farmers' markets at least for the produce over and above the allocated quota production may provide good incentive to farmers to produce more on the cooperative farm as well as on their own small kitchen garden plots and help alleviate critical shortage of staple food.

3. FOODCROP PRODUCTION IN 2010/11

3.1 Climate

DPRK has a continental climate with a relatively short cropping season (see Figure 2). Long winters bring bitterly cold and clear weather interspersed with snow storms as a result of northern and northwestern winds that blow in from Siberia. Average snowfall is thirty-seven days during the winter. The weather is particularly harsh in the northern, mountainous regions. Summer tends to be short, hot, humid, and rainy because of the southern and southeastern monsoon winds that bring moist air from the Pacific Ocean. The daily average high and low temperatures for Pyongyang in August are 29° C and 20° C. On average, approximately 60 percent of all precipitation occurs from June to September. Typhoons affect the peninsula at least once every summer. Spring and autumn are transitional seasons marked by mild temperatures and variable winds.

The winter of 2009/10 was colder and more prolonged than usual (see Figure 3). Average monthly temperatures for the whole country were below 0° C for the three months of December, January and February, while in the northern provinces of Ryanggang and Chagang average monthly temperatures stayed below 0° C for five months from November through to March. Not only did such low temperatures reduce the survival rate of winter cereals, but the prolonged duration of winter conditions had a significant negative impact on the timeliness of spring sowings and transplanting. For instance, Kujang County in North Pyongan reported average monthly temperatures in March, April and May that were below normal by 1.5°, 2.9° and 3° C respectively, and most production areas reported planting delays of between one and three weeks. In late

May much of the country experienced torrential rains which led to some serious local flooding (see Figure 4). The Yalu River burst its banks inundating a reported 7 000 hectares in the vicinity of Sinuiju in North Pyongan and affecting more than 23 000 people. Several areas elsewhere, especially on the east coast, were also affected.

Figure 2: DPRK - Crop Calendar

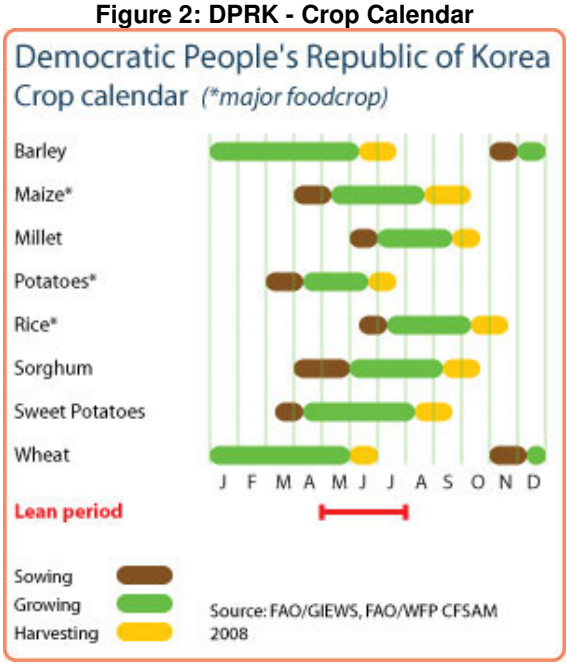
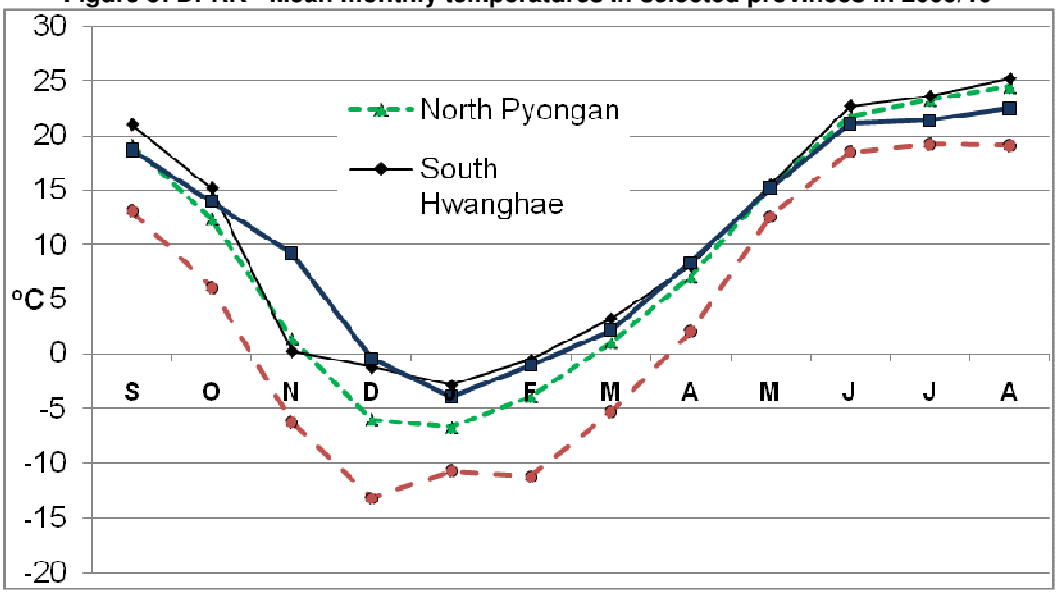
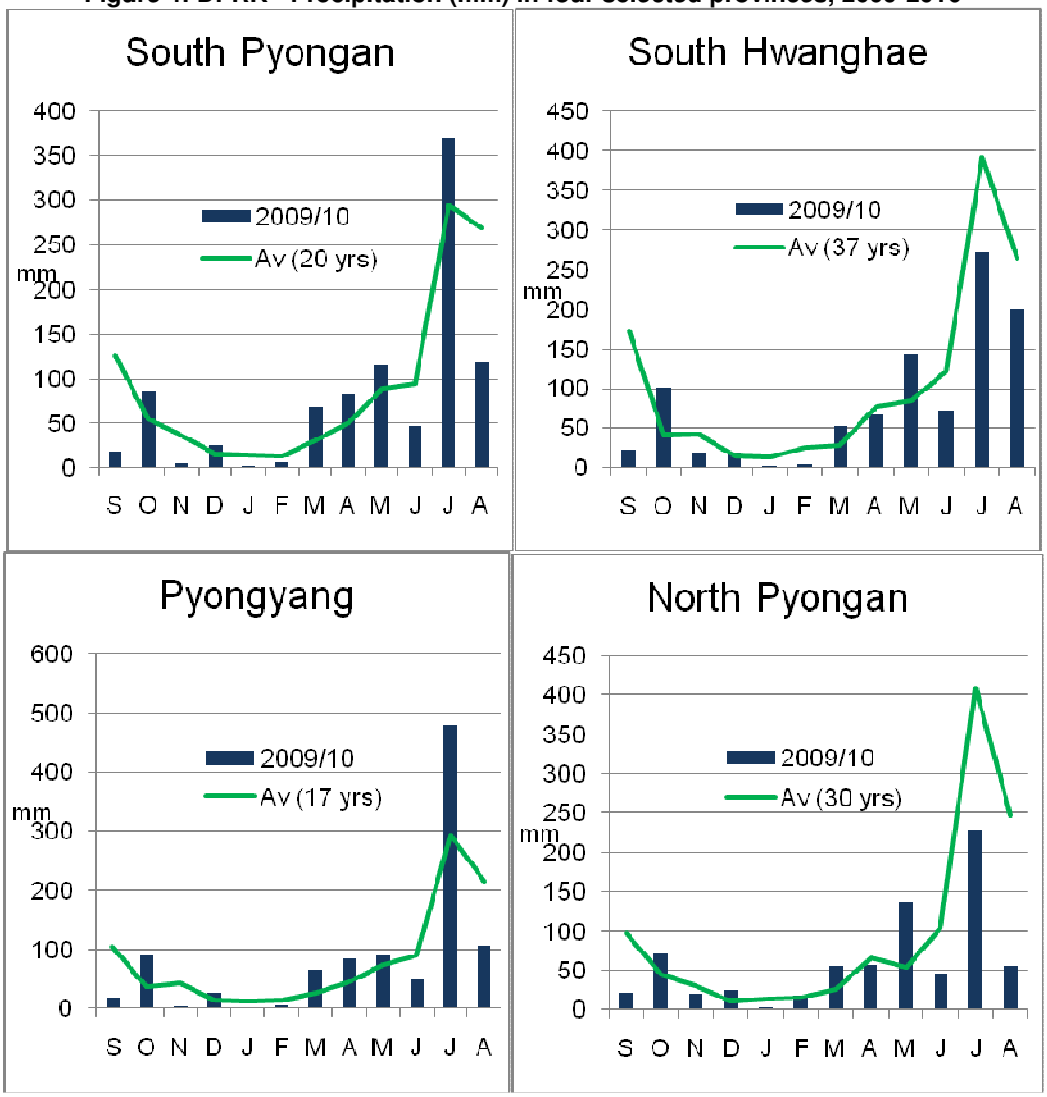


Figure 3: DPRK - Mean monthly temperatures in selected provinces in 2009/10



Temperatures picked up again in June and were slightly above average for the three months of June, July and August. While this in itself was beneficial for crop growth it brought with it increased humidity and cloud cover. Towards the end of the season in late August and early September very intense rainfall resulted in some serious flooding in several parts of the country. Sinuiju area was particularly badly affected but many other areas also suffered. Figure 3 shows monthly rainfall data by province and compares 2009/10 monthly rainfall with long-term averages for four selected provinces.

Figure 4: DPRK - Precipitation (mm) in four selected provinces, 2009-2010



3.2 Area planted

Total land area in DPRK amounts to 122 543 km^2, of which an estimated 17-18 percent, or slightly more than 2 million hectares, is cultivated. Approximately 1.4 million hectares are considered suitable for cereal cultivation, 300 000 hectares are under vegetable crops, some 160 000 hectares under fruit orchards[3] and a considerable area is allocated to various other food and industrial crops such as mulberry, cotton, tobacco and ginseng. Because of the mountainous terrain there is very limited scope for expanding cultivable areas and for this reason emphasis has been placed recently on increasing production by double-cropping.

The main-crop area under cereals, potatoes and soybeans this year amounted to 1 224 000 hectares, an increase of 1.7 percent on 2009, while a marginal reduction in area of 0.1 percent to 237 160 hectares is anticipated for the coming winter and spring crop. In aggregate, and including kitchen-garden and sloping-land production, the 2010/11 cropped area is expected to exceed that of 2009/10 by 1.1 percent.

[3] 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.

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 the narrow east coastal strip comprising parts of Kangwon, and North and South Hamgyong Provinces. Smaller areas are also cultivated in Jagang and Ryanggang Provinces. A recently-completed large-scale realignment operation to improve the layout of paddy plots, according to the Ministry of Agriculture, increased the overall paddy production area by about 60 000 hectares. In 2010, the area under paddy was reported as 570 186 hectares, representing a marginal increase of some 710 hectares on 2009.

Maize

Maize, which is mainly produced under rainfed conditions, is more universally distributed than paddy. This year's maize area of 495 026 hectares is virtually the same as that of last year.

Potato

Potatoes are grown as a spring (double) crop in the Cereal Bowl region, and as a summer crop in the cooler northern highlands (Jagang, Ryanggang), where a shorter growing season is experienced. As a double crop, potato is sown in March-April and harvested in June, while as a main crop it is sown in May-June and harvested in August-September. In response to the reduced productivity of the main cereals since late 1990s, and in an attempt to boost carbohydrate production, the land under potato has been gradually increasing in the major agricultural areas over the past decade. Greater emphasis has recently been placed on the early crop in view of the frequently poor yields of winter wheat. The availability of planting material is the single most important limiting factor to the expansion of the area under potato, as seed must be stored during the often severe winter months. Since losses in storage usually run at a minimum of 10 percent and may be considerably higher, FAO has recently provided some eleven over-wintering stores in major potato-producing areas. The areas under spring and main-season potato this year were 133 000 hectares and 48 000 hectares respectively, giving a total of 181 000 hectares. Since the maximum potential cultivable area for potatoes under present conditions is considered to be about 190 000 hectares, it is expected that a similar area to that of 2010, approximately 133 000 hectares, will be planted to early potatoes in 2011.

Winter wheat and spring barley

Winter wheat is sown from the end of September to mid-October, immediately after the harvesting of the main-season crops. Factors influencing the area under winter wheat include autumn rainfall, timely availability of seed, and the availability of adequate farm power and labour at a time when the demand for labour is high for various other operations, especially the harvesting of paddy. 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 some severe winters, especially the most recent one of 2009/10, has prompted farms to place increasing emphasis on early potatoes, though as yet without any significant reduction in the area under winter wheat. Spring barley is sown in March, and both winter wheat and spring barley are harvested in the second half of June. Areas of 73 000 hectares of winter wheat and 30 500 hectares of spring barley are expected in 2010/11, compared with achieved areas of 74 700 hectares and 29 600 hectares respectively in 2009/10. This represents a decline of 2.2 percent in the area under winter wheat and an increase of 3 percent under spring barley.

Soybeans

The area under soybeans has increased very considerably in recent years, growing from 63 000 hectares as recently as 2008 to more than 90 000 hectares in 2010. In a country in which diets are often protein-deficient, this trend is especially welcome.

Other crops

Other important crops produced in DPRK include sorghum, millet, buckwheat, vegetables (mainly cabbage, spinach, radish, cucumber, eggplant and tomato) and fruit (mainly pears, peaches, apricots, apples and

persimmons). Many farms also have sizeable mulberry plantations. At about 12 600 hectares, the area under minor cereals and grains such as sorghum, millet and buckwheat is similar to that of last year.

Household gardens

Each cooperative farm household is entitled to a private kitchen garden of 30 *pyong*, which equates to about 100 m^2. A recent informal survey indicates that the size of a kitchen garden can vary considerably from household to household but that the average size is close to the stipulated 30 *pyong*. There are about 1.7 million farm households in the country, which translates to about 17 000 hectares of household gardens. In addition, a significant proportion of urban dwellers also have access to smaller garden plots. In the absence of more reliable quantitative data, it is therefore assumed that the country's total household garden area may be about 25 000 hectares.

A typical pattern of cultivation in these gardens is an early crop of potatoes and green maize, followed by vegetables such as cabbage, peppers, radish and garlic. The main purpose and usage of household garden is to let individual families produce vegetables for their own consumption. Hence the contribution of kitchen gardens to the total in terms of cereal equivalent is relatively small and their importance is more likely to be in the area of nutrition and household income. However, crops in kitchen gardens are usually well cared for and yields of maize and potato may be expected to be higher than those achieved in the field. Assuming yields of 6 tonnes/ha for maize and potato on half of the country's kitchen garden area, production from this source would result in an extra 75 000 tonnes of cereal equivalent. In the absence of concrete data the Mission considers this a reasonable estimate of production to be added to the total farm production at this time. However, more quantitative information on garden crop production would be extremely useful in evaluating the importance of household food security and nutrition, especially considering that produce from gardens on farms is frequently shared with urban-dwelling relatives. Gardens also support a variety of small livestock including rabbits, pigs, goats and poultry which contribute significantly to household nutrition and income.

Crop production on sloping land

Following the severe food shortages of the mid- and late-1990s and the inability of the PDS to deliver full food rations, some urban/semi-urban dwellers were informally allowed to cultivate sloping land in excess of 15 degrees that had previously been restricted for cultivation. Although this is now seen as unsustainable and damaging, at least in its present form, at the time there were few practical alternatives and it was allowed as a temporary strategy to reduce food insecurity for vulnerable groups such as the elderly for whom pensions and PDS support were insufficient. The environmental degradation caused by slope cultivation has been recognised by the authorities for some time and Government continues to implement a long-term campaign of reforestation through the Ministry of Land and Environmental Protection (MoLEP). Although slope cultivation is said to be diminishing it is still evident in many parts of the country. In recognition of this, and in anticipation of a complete phasing-out of the practice, MoLEP keeps a register of users, most of who are said to be from the non-farming population. On slopes that are being re-forested, crop cultivation around the new trees is allowed until the canopy closes. Unfortunately the Mission was unable to visit Ryanggang Province and other northern mountainous areas which have one of the highest rates of sloping-land cultivation, but elsewhere the efforts at re-forestation were often evident.

There are considerable difficulties in estimating crop production from sloping land in DPRK; one of the problems associated with the estimation of sloping-land cultivation is its highly visible nature, which tends to exaggerate its extent. Not only is the contrast between naturally vegetated hillside and cultivated patch very stark, but a slope presents a wider angle of view to an observer on the ground than does a similar area of flat land. However, in 2008, MoLEP, using reports from its Forest Rangers, estimated that deforested area was between 300 000 and 350 000 hectares of sloping land.

With respect to productivity, many factors conspire to suggest very low yield expectations. 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 most cultivators are not from agricultural backgrounds, crop husbandry may be expected to be relatively poor. The overall yield figure of 0.5 t/ha proposed by the 2008 CFSAM would seem to be a reasonable estimate. Combined with an area of 300 000 hectares this gives a total production of 150 000 tonnes of cereal equivalent from sloping land. It should be noted, however, that slope land cultivation is neither encouraged nor allowed by the authorities, hence this source of food production is neither sustainable nor desirable in the long run.

3.3 Means of production and inputs

Planting material

In DPRK, a certain amount of suitable paddy and hybrid maize seed, produced by specialized cooperative or state farms, is provided on credit each year to cooperative farms through the Government's distribution system. However, despite improvements in DPRK's seed-production capacity, the opportunity to acquire new seed is limited by finances and availability, and most cooperative farms still use a high proportion of home-produced seed.

Paddy is typically planted in nurseries at the beginning of April and transplanted in late May or early June. Seed rates are high at 150 kg/ha, supposedly to compensate for low soil fertility. Seedbed preparation and transplanting were both delayed this year by the prolonged winter. Hybrid maize is planted at between 40 and 50 kg/ha, giving a plant population of 35 000 - 50 000 per hectare.

Potato planting material in DPRK is often of poor quality and seeding rates are lower than recommended because of supply shortages. The practice of dividing tubers into several pieces for seed not only depresses yield but also encourages disease infestation. These shortcomings, as well as inadequate crop rotation and often premature harvesting, are reflected in the low yields obtained. Although yields have improved in the last ten years or so they are still, at about 13 tonnes fresh weight per hectare, considerably lower than their potential under DPRK conditions.

Sufficient seed for planting the planned area of winter wheat is said to be available. The nationally recommended seed rate for both wheat and barley is 150 kg/ha.

Fertilizer

According to the MoA, 498 816 nutrient tonnes of fertilizer were used in DPRK during 2010, compared with 445 983 tonnes in 2009 and 456 297 tonnes in 2008 (see Table 2). The amounts applied were greater than in the previous two years for all three major elements, N, P and K. While domestic production of both phosphate and potash exceeded that of 2008 and 2009, nitrogen-based fertilizer production was similar to that of 2009 but considerably less than that of 2008. Typical fertilizer application rates this year in the Cereal Bowl provinces ranged from 400 to 470 kg ammonium sulphate equivalent per hectare of paddy (about 170 to 200 kg per hectare of urea, the most commonly used product), with similar, or slightly lower, rates for maize.

Table 2: DPRK - Fertilizer statistics for 2008-2010 (tonnes)

	Year	Domestic production	Import	Assistance	Stock from previous year	Application	Remaining stock
N (amm. sulph. equivalent)	2010	174 350	274 580	24 670	3 000	475 100	1 500
	2009	170 090	266 817		900	434 807	3 000
	2008	256 800	180 500	657	1 400	438 457	900
P	2010	11 402				11 402	
	2009	2 776				2 776	
	2008	7 425				7 425	
K	2010	12 314				12 314	
	2009	8 400				8 400	
	2008	10 415				10 415	
Total (N, P, K)	**2010**					**498 816**	
	2009					**445 983**	
	2008					**456 297**	

Lime

Crops yields in DPRK are frequently limited by soil acidity with several farms reporting soil pHs of between 4.5 and 5.5. The availability of lime is not usually a constraint but the means of transporting it to the farms often is. Most farm managers have been limited to applying about half a tonne of lime per hectare every three years, which they acknowledge is insufficient. This year, however, with the enhanced availability of diesel and the slight overall improvement in transport, farms have been able to apply more lime to their land; it is to be hoped that this will manifest itself in long-term yield increases in the coming years.

Pest and disease control

2010 was unexceptional with regard to crop pest and diseases apart from the return, apparently after about 40 years, of the plant hopper *Sogata furcifera*. A vector of virus diseases, especially in rice, this pest is potentially very destructive. The gap of 40 years or so is not peculiar to DPRK; the insect has re-emerged in a number of East Asian countries after a similar period, possibly as a manifestation of ecological imbalances resulting from the over-use of pesticide in the region. While the outbreak was satisfactorily controlled this year using both imported (deltamethrin) and locally manufactured organic pesticides, early preparations should be made for the control of what may be a more serious outbreak next year. According to the MoA, a total of 331 tonnes of pesticide was used this year countrywide.

The very intense rainstorms at the end of August and the beginning of September soaked crops that should have been drying off for harvest and also left the land very wet. Such conditions, combined with relative warmth, are highly conducive to the spread of moulds and other fungal diseases. Mould, especially on maize cobs but also on rice panicles, was observed by the Mission at several farms.

Crop weeding by hand is extremely labour-intensive and involves huge amounts of time and energy. The increased availability of the herbicide butachlor (545 tonnes this year) has reduced this labour requirement and thereby enhanced the timeliness of farm operations.

Potato blight regularly affects crops in some areas, as does aphid infestation.

Farm power

The shortage of functioning tractors and haulage vehicles has been one of the main constraints to DPRK's agricultural production over the last 15 years and more. However, this constraint now appears to be easing very slightly with the re-conditioning of a number of the country's 28-hp Chollima tractors, the production within the country, of some new tractors, and the acquisition of a number of imported tractors donated by the EU and other agencies. By 2004 only 57.5 percent (36 836) of the country's 64 062 tractors were operational, and it was estimated that about half of the land in the Cereal Bowl had consequently to be prepared using draught cattle and human labour. The total number of tractors in the country continues to fall slowly, but the proportion that is operational has increased. By 2009, 72 percent (45 753) of the country's 63 546 tractors were reported to be operational, and by 2010 this figure had increased to 73 percent (45 981) of 62 988. The availability of tractor power has a very significant impact on agricultural production and especially on the extent of double cropping which requires a rapid turn-around between the harvest of the main season crops and the planting of winter wheat. The continuing slight increase in the area that is double-cropped attests to the improving situation, as did the Mission's sighting of a larger number of tractors in the field and on the roads than in previous years. However, major structural problems associated with maintaining tractors in working order persist, including a chronic shortage of spare parts, tyres and fuel. Although the availability of diesel within the country is said to have improved this year very little of it is of high quality.

Electricity supplies have seen some improvement this year and farms that depend on electric pumps for irrigation have reported fewer problems this year than in the recent past. Likewise, the supply of electricity for threshing is expected to be more reliable.

Irrigation

The proportion of gravity-fed irrigation systems has increased significantly in the last decade with the construction of new canals. However, many systems still depend on electrically powered pumping stations. This year, the power supply was better than it had been for several years, and the irrigation situation was satisfactory. Reservoir levels were satisfactory throughout the cropping season; they were slightly above the planned level at the beginning of the season and by the end of September, with the often very heavy rains received during the summer, water levels had increased to 3 percent above the planned level.

3.4 Yields and production

Parameters of foodcrops produced on farms in DPRK for 2009/10 are presented in Table 3. Early- and main-crop figures are based on a combination of Government estimates, on-farm discussions, field observation, and discussions with other agencies involved in crop production. Cooperative farms carry out cereal crop production assessments on representative fields, using several samples, soon after heading and again

shortly before harvest. The Mission considers that the methodology used by the farms is sound and that their assessments are well executed and objective. Most of the yield adjustments made by the Mission were necessitated by taking account of the damage caused by the heavy rains at the end of August and the beginning of September. The Mission felt that the full extent of the damage in terms of useful harvest (and hence yield reduction) was frequently under-estimated.

Winter and spring crop production forecasts for 2010/11 (to be harvested in 2011) are based on a combination of Government target crop areas, on-farm discussions and recent reported yields. Yields achieved in 2008/09 were considered to be more normal than those achieved during and following the long and hard winter of 2009/10 and have therefore been used in the forecast. Anticipated areas for the winter and spring crops of 2010/11 have been calculated by applying recent area trends to the areas cropped in 2009/10. Table 4 gives the sum of area and production of main crops, and winter and spring crops, by province. The grand total in this table includes the Mission's estimates of household garden and hillside plots production (see above). Table 3 compares area, yield and production of the main season cereals and potatoes (in cereal-equivalents) for 2010, and Table 4 shows the national changes in area, yield and production of DPRK's main crops and early season forecast for 2010/11 in comparison with 2009/10.

Paddy

This year's national paddy yield, at about 4.26 tonnes per hectare, showed an increase of 3.6 percent over last year's 4.10 tonnes per hectare. Although most transplanting was delayed by the cold conditions at the beginning of the season, several positive factors contributed to the yield increase. These included a greater availability of fertilizers, herbicides and pesticide, an improved electricity supply for irrigation pumps, and no shortage of irrigation water. This year's production of 2.43 million tonnes of paddy shows an increase of 3.7 percent over that reported for last year. Assuming a milling ratio of 65 percent, this year's production equates to 1.58 million tonnes of rice.

Maize

Average maize yields this year of 3.35 tonnes per hectare showed a small reduction of 1.2 percent on last year's 3.39 tonnes per hectare. Although the summer months were warm, skies were often overcast, limiting grain filling. The crop also suffered from the rainstorms in late August and early September, with some significant spoiling and loss of yield just prior to and at harvesting. National maize production this year, at 1.68 million tonnes, is down by 1.3 percent on last year's 1.71 million tonnes.

Potatoes

At 13.2 tonnes/ha fresh weight this year's main-crop potato yields were up by more than 15 percent on last year. Although most planting was delayed by the protracted winter conditions, the warmth of the subsequent months contributed to the improved yield. This year's national production of main-crop potatoes in cereal equivalent is estimated to be 158 000 tonnes, up by more than 12 percent on last year's 139 000 tonnes. The more important early crop of 2011 is also expected to show a production increase of 8.5 percent over that of 2010

Post-harvest losses

The level of post-harvest crop loss in DPRK has long been an issue, with estimates ranging from 2 percent to more than 30 percent. Unfortunately, no quantitative investigations have been undertaken to clarify the issue. There are many stages at which significant loss can occur. In the case of paddy, if the harvest is delayed there may be some shattering in the field. Immediately after harvest, crops are left to dry in the field; if the paddy field has not been sufficiently drained or if there is substantial rainfall following the harvest (as there was this year), the crop may be left lying in damp conditions which are conducive to rotting and further grain loss. Delayed collection of the crop from the field leaves it susceptible to rodent and insect damage. Losses may occur while the crop is being transported from the field to the thresher. Old or inefficiently set threshers may cause loss. Delays in threshing (which are very common as a result of power shortages, though less so this year) can cause losses in the paddy stored on the stalk. Finally, after threshing and bagging, losses may occur in storage.

It appears, however, that a great deal of care is taken of the crop at all stages and that losses are minimized insofar as circumstances allow. For instance, work gangs glean for dropped grain in the field after the crop has been removed, the harvest is placed carefully on trailers for transport to the threshers, and sheaves may be put through the thresher several times to ensure that all the grain has been removed. Nevertheless, there

are several uncontrollable variables such as rainfall and power supply which can thwart farmers' best efforts, and, without the implementation of effective control measures - as appears mostly to be the case - rodents may make significant inroads into stored grain. The Mission once again recommends that a study be undertaken to quantify losses at each vulnerable stage. In the absence of any better estimate, but suspecting that the level of post-harvest crop losses may, in fact, be rather lower, the Mission continues to use the figure of 15 percent as in previous years.

Table 3: DPRK - Main-season crop area, yield and production of grains and potatoes in 2010

	Paddy			Maize			Potato (cereal equiv.)			Soybeans			Other cereal crops			Total		
Province	**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 City	16	5.03	78	7.3	3.64	27	0.7	2.46	1.8	2.3	1.91	4.3	0.8	1.62	1.3	27	4.22	112
South Pyongan	83	4.81	399	61	3.32	204	0.5	2.47	1.2	10	1.75	17	1.4	1.41	2.0	156	3.99	623
North Pyongan	101	4.48	453	87	3.54	308	5.4	2.56	14	10	1.75	18	1.4	1.63	2.2	205	3.87	795
Chagang	7.0	3.74	26	35	3.02	106	2.2	2.78	6.2	4.9	1.53	7.4	1.3	1.42	1.9	50	2.92	147
South Hwanghae	146	4.67	682	87	3.47	301	2.8	2.56	7.1	15	1.73	26	1.9	1.58	3.0	253	4.04	1 020
North Hwanghae	70	4.31	300	80	3.58	285	0.8	2.40	1.9	16	1.67	26	2.4	1.54	3.6	168	3.67	616
Kangwon	34	2.93	100	36	3.17	115	0.6	2.29	1.3	6.2	1.72	11	1.8	1.47	2.7	79	2.91	229
South Hamgyong	60	3.08	185	47	3.22	150	9.6	3.49	34	7.2	1.78	13	0.3	1.58	0.5	124	3.09	382
North Hamgyong	25	2.89	72	50	3.05	151	5.5	3.46	19	11	1.77	19	0.5	1.60	0.7	91	2.87	262
Ryanggang	2.0	2.23	4.4	5.5	2.11	12	19	3.68	70	5.8	1.41	8.1	0.7	1.50	1.0	33	2.89	95
Nampo City	27	4.71	128	7.6	3.26	25	0.9	2.64	2.3	2.1	1.81	3.8	0.2	1.40	0.3	38	4.19	159
DPRK	**570**	**4.26**	**2 426**	**503**	**3.35**	**1 683**	**48**	**3.30**	**158**	**90**	**1.71**	**154**	**13**	**1.52**	**19**	**1 224**	**3.63**	**4 441**

Table 4: DPRK - Comparison between 2009-2010 and 2010-2011 aggregate foodcrop production in cereal equivalent

	2010/11			2009/10			change 2010/11 over 2009/10		
	Area 000 ha	**Yield t/ha**	**Prod. 000 t**	**Area 000 ha**	**Yield t/ha**	**Prod. 000 t**	**Area (%)**	**Yield (%)**	**Prod. (%)**
MAIN SEASON	**2010**			**2009**					
Paddy	570	4.26	2 426	569	4.10	2 336	0.1	3.6	3.7
Maize	503	3.35	1 683	503	3.39	1 705	-0.1	-1.2	-1.3
Other cereals	13	1.52	19	13	1.78	22	0.0	-17.2	-17.3
Potatoes	48	3.30	158	50	2.79	139	-3.8	15.4	12.2
Soybeans	90	2	154	68	2	149	24.2	-27.7	3.2
Total main-season crops	**1 224**	**3.63**	**4 441**	**1 203**	**3.62**	**4 352**	**1.7**	**0.4**	**2.0**
EARLY CROP SEASON	**2011**			**2010**					
Wheat and barley	104	2.32	240	104	1.95	203	-0.7	58.1	15.4
Potatoes	133	3.20	427	133	2.94	390	0.4	8.2	8.5
Total winter/spring crops	**237**	**2.81**	**667**	**237**	**2.50**	**593**	**-0.1**	**11.1**	**11.0**
National farm total	**1 461**	**3.50**	**5 108**	**1 441**	**3.43**	**4 945**	**1.4**	**1.8**	**3.2**
Total incl. gardens and slopes	**1 786**	**2.99**	**5 333**	**1 766**	**2.93**	**5 170**	**1.1**	**1.9**	**3.1**

3.5 Livestock

Cattle numbers have remained fairly static over the last decade with most farms still maintaining large numbers of draught oxen. However, numbers of goats, rabbits, ducks and geese have grown significantly since 2000 (see Table 5), and goat and geese numbers continue to increase. With their rapid breeding cycle and a population now outnumbering DPRK's human population, rabbits represent a significant source of food. Pig numbers have been deliberately reduced since 2004 because of their high demand on limited grain supplies. However, the population appears to have started growing again in the last two years.

Most farms have fish ponds which contribute appreciably to household diet. The most common species grown are catfish and carp. Catfish mature quickly and the yields up to 5 t/ha annually are reported.

Table 5: DPRK - Livestock population, 2000- 2010 ('000 head)

	2000	2004	2008	2009	2010	% change	
						2000 to 2010	2008 to 2010
Cattle	579	566	576	576	577	-0.3	0.2
Pigs	3 120	3 194	2 178	2 150	2 248	-28	3.2
Sheep	185	171	167	165	166	-10	-0.6
Goats	2 276	2 736	3 441	3 570	3 556	56	3.3
Rabbits	11 475	19 677	26 467	28 500	28 571	149	7.9
Chickens	14 844	18 729	14 071	13 859	14 943	0.7	6.2
Ducks	2 078	5 189	5 878	5 900	5 936	186	1.0
Geese	889	1 580	1 477	1 355	1 626	83	10

Source: MoA

4. FOOD SUPPLY/DEMAND BALANCE 2010/11

A national food supply/demand balance sheet, including potatoes in cereal equivalent, milled rice and soybeans, from November 2010 to October 2011 is presented in Table 6. In preparing the balance sheet, the following assumptions were made:

- 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 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 2010 to October 2011 as 24.427 million.

- As in the past, an annual **per capita consumption** rate of 167 kg of cereals (including potato in cereal equivalent and milled rice), and additional 7 kg of soybean is used giving a total of 174 kg as food requirements. This is slightly higher than the apparent national average consumption in last few years, but is also below the Government's target consumption rate. The Government uses an average target consumption rate of 213 kg/person/year (unmilled, including paddy) which is equivalent to about 176 kg when paddy is converted to milled rice. The Mission's level of consumption on average represents about 1 640 kcal is used. The remaining energy and other nutrients are assumed to be derived from fish, poultry and meat, sweet potatoes, vegetables, fruits and wild foods.

- Normal year **seed requirement** of 219 000 tonnes, based on the seed rates used in DPRK and the intended area to be sown in 2010/11 are:

    - Rice: 97.5 kg/ha of rice (or 150 kg of paddy) on 570 000 hectares.
    - Maize: 45 kg/ha on 503 000 hectares.
    - Wheat, barley and other cereals: 200 kg/ha on 103 000 hectares.
    - Potato: 625 kg/ha in cereal equivalent (or 2.5 t/ha fresh weight) on 181 000 hectares.

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

- The MoA is currently using an estimate of total **feed requirement** of cereals at 120 000 tonnes. However, it used a requirement of 180 000 tonnes in 2008. Given that the number of small animals has gone down over the years and the number of large animals has increased or stayed the same, the Mission decided to use grain requirement of 150 000 tonnes for the current marketing year.

- Consistent with the previous CFSAM reports, a **paddy-to-rice milling ratio** of 65 percent is used. No other grains are converted to milled form as the food and other requirements are expressed in the whole grain form.

- Given that **soybean in DPRK** is the principal source of protein, this crop has been added to the food balance sheet for the first time. On average the calorie content of soybean is about 20 percent higher than that of cereals[4] but given that the total quantity of soybean production is very small in the total foodgrain production in DPRK and also that the statistics provided by the MoA aggregates soybeans in total grain production, the Mission has not converted it to cereal equivalent.

- According to the information provided by the MoA, recognizing the projected food deficit, the Government plans to make **commercial imports** of 325 000 tonnes of cereals, including rice and maize, during the 2010/11 marketing year. The exact composition is not known yet. This is why food consumption and total utilization are not shown by commodity in the food balance sheet.

- As indicated by officials and observed by the Mission in some county warehouses, the public distribution stocks as of the end of September 2010 were practically exhausted. It is difficult to get a real figure of the stocks in the country. Hence only stock build-up at the end of the year, equivalent to the two week national food requirements, is assumed.

Table 6: DPRK - Food Balance Sheet - 2010/11 (November/October), '000 tonnes

	Rice (milled)1/	Maize	Wheat and barley	Other cereals	Potato (cereal equiv.)2/	Soybeans	Total3/*
Domestic availability	**1 577**	**1 683**	**240**	**19**	**585**	**154**	**4 484**
Domestic production 3/	1 577	1 683	240	19	585	154	4 484
- Main-season production	1 577	1 683		19	158	154	3 592
- Winter/spring production			240		427		667
Total utilization							**5 351**
Food use							4 250
Feed use	0	75	0	0	55	20	150
Seed requirement	56	23	21	2.5	113	4.5	219
Post harvest losses	237	253	24	2	24	15	554
Stock build-up	100	77	0	0	0	0	177
Import requirements							**867**
Anticipated commercial imports							325
Uncovered Deficit							542
of which, food aid assistance on hand or pledged							21

1/ Paddy to rice milling rate of 65 percent.
2/ Including potatoes in cereal equivalent at 25 percent conversion rate.
3/ Total includes household garden production (75 000 tonnes) and production on slopes (150 000 tonnes).
* Figures may not add-up exactly due to rounding.

The total cereal import requirement in 2010/11 is estimated at 867 000 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. The last two CFSAMs calculated cereal import requirements at about 900 000 tonnes in 2004/05 and 1.79 million tonnes in 2008/09. Over the last four years the food gap is narrowing, but it still remains

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

close to a million tonne mark. Food aid in stock or expected to arrive shortly is estimated only at 21 000 tonnes of cereals.

5. HOUSEHOLD FOOD SECURITY AND VULNERABILITY ANALYSIS

This section of the report is based on discussions with key Government officials at the national, county and provincial levels, the international community and households. It relies on review of secondary data from recent food security assessments, previous CFSAMs and national data sets. Visits were made to the agricultural cooperatives, public distribution centres, kindergarten, schools and hospitals. The Mission covered 11 counties and visited both rural and urban areas. The major limitation to the study was the inability of the Mission to randomly select counties, institutions and cooperatives to be visited. All households that the Mission had contact with were selected by the Government officials. Furthermore, the language barrier prevented the Mission to have effective discussions with households and key informants and thus, the collection of information. Nevertheless, to the extent possible the Mission cross-checked the information collected at the various levels to ensure consistency.

5.1 Current food assistance programmes

During the marketing year 2009/10 total food assistance distributed in DPRK amounted to 29 886 tonnes; all except 462 tonnes was by WFP. In May 2008, the DPRK Government requested emergency assistance in response to the 2007 floods. A WFP Emergency Operation calling for distribution in 131 counties was launched in September 2008 which subsequently was scaled back to 60 counties/districts and targeted 1.9 million beneficiaries through to June 2010.

In July 2010, a two-year protracted relief and recovery operation (PRRO) was launched with emphasis on nutritional support for women and children. Eleven factories are supported where WFP imported food assistance is processed into nutritious foods such as corn-milk blend (CMB), corn-soya milk blend (CSM), rice-milk blend (RMB) and biscuits made from fortified maize and wheat flour. These fortified products are distributed to pregnant and lactating women, children and accompanying mothers in paediatric hospitals/wards, orphanage children (baby homes, children centres and boarding schools), and children attending child institutions (nurseries, kindergartens and primary schools).

Food for Work projects, locally known as *Food for Community Development* (FFCD aims to support food insecure/vulnerable households in the communities with temporary employment opportunities particularly during agricultural lean period. WFP is presently distributing food aid in 65 counties in 7 provinces (North and South Hamyong, Kangwon, North and South Hwanghae, North and South Pyongan).

WFP is presently distributing food in 65 counties in 7 provinces (North and South Hamyong, Kangwon, North and South Hwanghae, North and South Pyongan).

5.2 Household food security and nutrition

The DPRK population of about 24 million can be divided into three categories: 1) farmers (about 30 percent) 2) PDS dependent population (about 68 percent) and 3) others (2 percent). It is difficult to assess livelihood and coping strategies of households in DPRK as this information was not available to the Mission.

5.2.1 Food sources

The main sources of food for households are through two major systems:

In-kind payment through the cooperatives

At harvest, cooperatives sell cereal to the Government but are entitled to buy back at from Public Distribution Centre (PDC) prices their allocated ration for the year. Thus in a sense they receive in-kind earnings provided as a standard ration of 600 grams cereal equivalent per day per family member. The remainder of their wages are paid to them as cash. All cooperative farmers across the country receive a standard cereal ration irrespective of the production level of the cooperative. The cash earnings, however, depend on the level of surplus production sold to the State Food Procurement Agency. The total revenue from sales minus the cost of inputs, amount set aside for any investments/repairs, any outstanding loans and contingency reserves is the net revenue that is shared among the farmers. A point system is used to ensure that farmers who put in more time receive higher earnings. This system is not equitable since the net earnings depend on the productivity of the farm they operate. For example, farmers in the northern mountainous regions, or farms

with very poor soils, are likely to earn lower cash income than others. Farming households in the southern part of the country appeared to be better off than households in the northern mountainous regions.

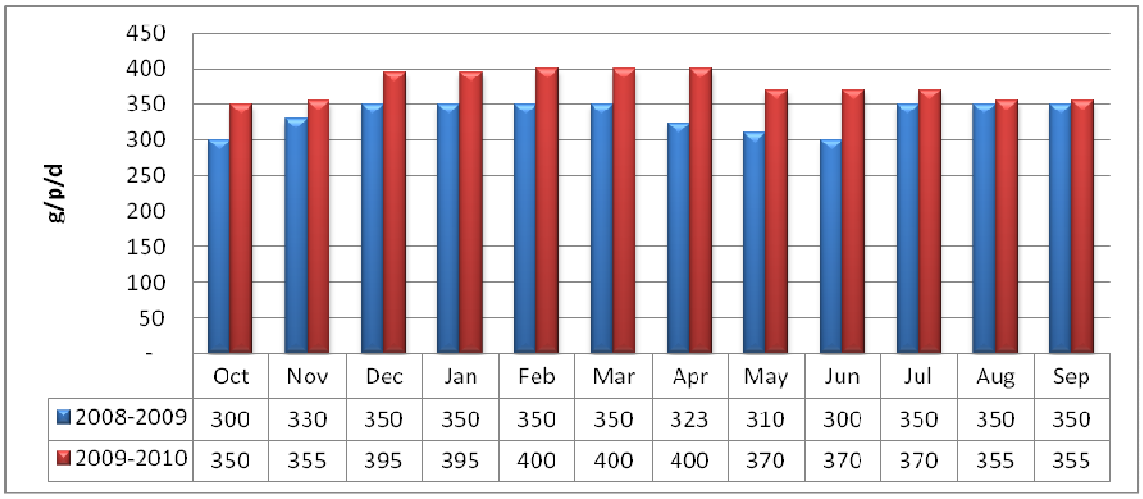
Public Distribution System

This population group consists of all other economic activities excluding the military and cooperative farmers. Working population in this group receives a cash income and are allowed to purchase cereals PDC at subsidized prices. The recommended cereal ration for purchase per family member per day is 573 g, amounting to about 209 kg/person per year. In practice, the amount of cereals received by this group depends on the level of production nationally in a given year and is carefully planned in September/October at the time of the harvest (see Figure 5). In 2009/10 households received a reduced ration on average about 375 g per day or approximately 136 kg per year per person as there was a cereal deficit at the national level.

In principle, all regions receive the same ration across the country but adjustments are made accordingly each month to ensure that food available at the national level stretches to the next harvest. The types of staple commodities households receive vary by county and region depending on the main cereal grown/available in the area. In general, the PDS ration consists of rice, maize, barley, wheat, soybeans and potatoes. Rice is the most preferred commodity and paddy, at national average, amounts to about half of the total unmilled ration target amount. Not all households receive the same amount of rice. The rice producing regions receive a higher rice ration than the predominantly maize growing regions.

The Government meticulously runs the PDS to ensure that all regions and counties have food for its population. It provides fuel and transport for moving cereal from the cooperative where it is bought to public warehouses, prior to transporting to the food deficit regions. Figure 5 shows the cereals distributed monthly on a per person/per day basis during the 2009/10 consumption year.

Figure 5: DPRK - Public distribution system average monthly rations (grams of cereals), 2008/09 and 2009/10



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2008-2009	300	330	350	350	350	350	323	310	300	350	350	350
2009-2010	350	355	395	395	400	400	400	370	370	370	355	355

During the Mission in October, it was evident that there was very little cereal in stock in the visited county warehouses. Cereals available, mostly maize, for distribution in October were harvested from the current harvest in September/October, hastily dried, on the PDC floor or on the roadside, prior to bagging and further distribution through the public distribution system. Due to inadequate drying facilities and time, maize that was distributed had very high moisture content and unhealthy contaminants.

5.2.2 Market sources of food

State Shops

Most foods, other than cereals and non food commodities are bought from the state shops where prices are controlled and are generally lower than in the farmers (open) markets. Households indicated purchasing foods such as salt, bean-paste, soy sauce, oil and vegetables from the state shops. The availability and variety of foods in the state shops vary by region. The Mission was not able to gain access into the State shops or open markets.

Open markets

Households also buy foods from the open markets, also called farmers' markets. These take place three times, on 1st, 11th and 21st of each month. Foods sold in the open markets are mainly fruits and vegetables. Prices are not controlled and retailers and households negotiate the price. Cereals are prohibited for sale in DPRK but could be found in the open market for sale or barter. Their prices could be high.

In Pyongyang open market (*Tongil market)*, informal sources told the Mission that the price of rice was above KPW 1000 per kg compared to KPW 24 in PDC - more than 30 times higher than the PDC. In 2004, the FAO/WFP CFSAM reported that the price of rice in the open markets was KPW 500-600 per kg and was 11-14 times that the PDS price, while that of maize was KPW 320 per kg and was about 11 times higher than the PDS price.

Rice is the most preferred staple food but is about 30 percent of the food commodity that is distributed through the PDS. It should be noted that proportion of rice (milled in total cereal equivalent) to the total cereal production last year was about 36 percent. The fact that rice is sold on the market for such a high price is indicative that it is in high demand and not easily available within the markets.

5.3 Livelihood strategies and coping mechanisms

Income levels are difficult to obtain in DPRK. The Government declined to provide minimum wages for any category of workers. Households were not able to provide information related to income. The mission attempted to estimate incomes through questions on household expenditures to determine the extent of households' access to food. Even with this approach, information was not provided fully and was obtained only from a few households. Therefore, the information on incomes should be interpreted with caution. Discussions with households in 11 counties shows that a household of four people spends about KPW 1 550-1 800 per month on food, of which about one third is expenditures on cereals bought through the PDS. Food expenditures are about 30-50 percent of total income. Using expenditures as a proxy of income, on average household income could be about KPW 3 000-5 000 per month.

Some PDS dependent households indicated that the PDS cereal rations were not sufficient and so they bought additional cereals. Prices in the open markets are many folds higher than in the state or PDS as they are not controlled. Very few households could afford to purchase additional cereals in the open market. Some PDS dependent households reported receiving cereals and vegetables from their cooperative farming relatives. This was corroborated by farming households who reported sharing their surplus ration with some of their PDS relatives. In a study by the WFP conducted in 2004, about 40 percent of PDS households reported receiving food from their relatives.

There are very limited opportunities for households to earn either extra income or access additional food. The most common activities include the following:

- **Kitchen gardens**. About one in two PDS dependent households have a kitchen garden. Almost all farming households have access to a small piece of land for growing vegetables. Vegetables grown include cabbage, spinach, onion, garlic, beans and tomatoes. Households that have a kitchen garden fully utilize the land, often growing three rounds of vegetables in one year. Vegetables from the kitchen gardens could be sold or bartered in the open markets.

- **Small livestock production.** According to a recent survey undertaken by WFP, about 67 percent of households own small livestock – often one or two piglets, a few rabbits or some poultry. Fewer PDS dependents rear livestock due to limited space in the apartment buildings. During the Mission, many households reported to have recently slaughtered their animals for bartering with other foods and/or consumption. A kilogram of pork is bartered for 2 kg of rice while 1 kg of garlic could be exchanged for 1 kg of pork.

- **Gathering wild foods.** Many households collect foods from the wild for consumption and sale. Common foods collected include sprouts, vegetables, mushroom and fruits. Wild food gathering is most common among households in the mountainous areas. About 4 out of 5 households hunt, fish or gather food according to a recent 2010 WFP survey. However, these activities are seasonal and are conducted primarily in summer and spring.

- **Other sources of income** include sewing, petty trading, shoe repair, sale of fruits and fishing for households living near the sea. Sale of vegetables and fruits is often carried out in the open markets. However, there are restrictions on who could sell in the market. Preference to sell in the market is given to women over 40 years of age. The Mission observed a few petty trading stands, often selling biscuits and sweets, cigarettes, etc but with very few and little variety of commodities. The Mission was not given access to these stands and it was therefore difficult to assess the variety of commodities sold or incomes earned from these activities. In rural areas, there were quite a few women sitting by the road side selling fruits and vegetables.

5.4 Food consumption patterns and nutrition

5.4.1 Food consumption

Households were asked to list the foods they consumed in the past 24 hours as well as the last seven days. All households consumed cereals on a daily basis and all households reported the consumption of a variety of vegetables, consisting of cabbage, onions, tomatoes, chillies and garlic. However, not all households had adequate amounts of soya or bean paste, the main source of protein in DPRK. An average household of three was able to afford about 2 kg of bean paste for one month, while better off households of about 5 people could afford more bean paste, about 5-6 kg/month. Better off households could afford a combination of foods including meat. For the average household, meat consumption is rare and is not the norm as many households have few animals. During the Mission, households reported slaughtering of animals in August, during a major festival and were waiting to receiving breeding stock from the Government to start rearing again. Many urban households are not able to rear animals due to the lack of space and inadequate time to care for the animals. Hence, their source of meat is State shops, costing about KPW 170 per kg for pork.

The energy requirement of population recommended by WHO/FAO in tropical countries is about 2100 kcal with 10-12 percent of kcal derived from protein and 17 percent from fat. These requirements are adjusted based on environmental temperature, basal metabolic rate (BMR), Body Mass Index (BMI) of men and women and the demographic profile of the population. A recent review of calorie requirements for Koreans living in DPRK based on these factors - their mean weight, age composition, work patterns and temperature levels shows that on average they require 2450 kcal to maintain the current work level and body weight.[5]

Cereals consumed by the households are obtained from the PDS. The government target ration is 573 grams of cereal per day per person. On average in 2009/10, households were only provided 375 grams of mixed cereal commodities. This amount of cereal provides about 1290 kcal – about 52 percent of the energy requirement for DPRK population.

A cereal intake of about 52 percent of the required calories means that households would have to obtain the rest, 48 percent of their calories from non-cereals food commodities. Households in poor economies rely primarily on cereals for up to 80 percent of their calories. Cereals are the most important source of energy for most households as other foods are relatively expensive. A review of seven day food frequency count of the households interviewed revealed that a dietary intake, primarily consisting of very little dense energy foods (other than cereals), comprising of mostly of vegetables. These other foods could not make up the missing 50 percent calories. The average PDS population are not able to fill the energy gap with the other foods and are consistently consuming below their energy requirement.

The gap in food consumption could be quite large for many households. Hunger and undernourishment in DPRK is widespread especially for the low income PDS population groups who have very little coping mechanisms to fall back on. The food assistance programme is carefully providing supplementary foods and targeting children, pregnant and lactating women, thus cushioning them from the inadequate dietary intake that many PDS adults are facing. The targeted supplementary intervention has contributed to keeping the levels of child malnutrition relatively low.

5.4.2 Nutritional status

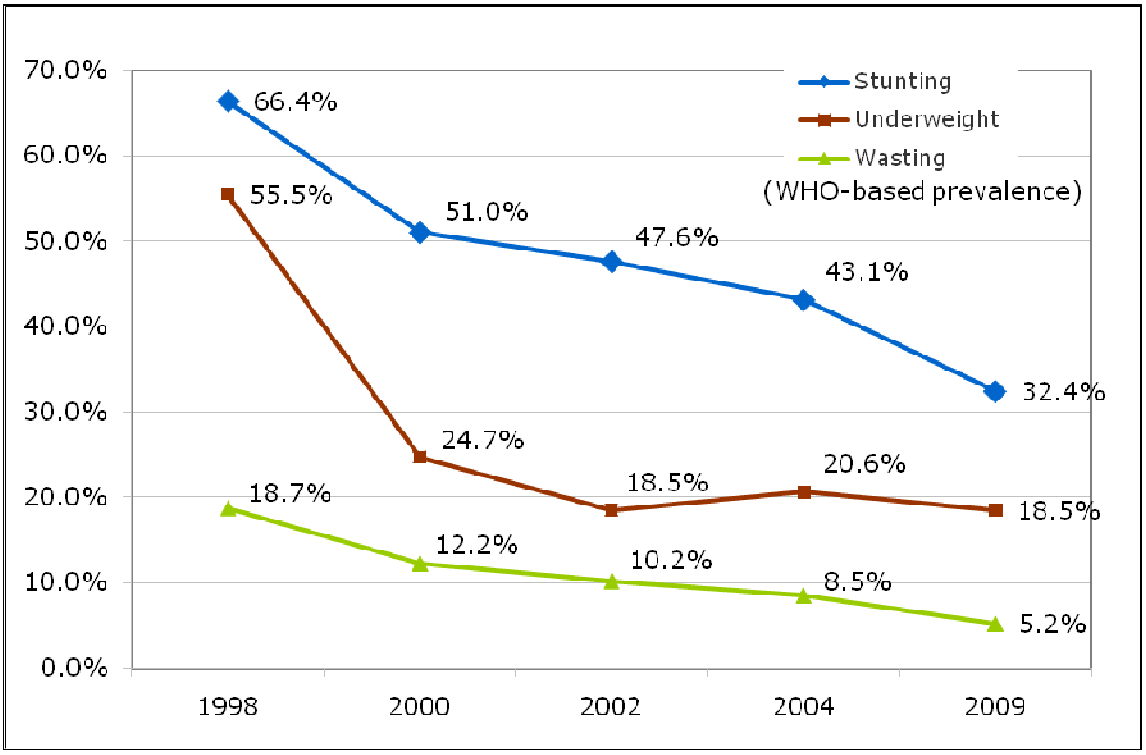
The DPRK has been undertaking nutrition surveys since 1998 in collaboration with UNICEF and WFP. The Multiple Indicator Cluster Survey (MICS) was carried out in 2009 by Central Bureau of Statistics (CBS) in collaboration with Child Nutrition Institute with technical and financial support from UNICEF. It provides up-to-

[5] See WFP Food and Nutrition Handbook recommendation, Annex 8.2

date information on the situation of women and children and measures key indicators that allow countries to monitor progress towards the MDG and other international commitments.

The 2009 DPR Korea MICS shows an improvement in the nutritional status among the population. Nonetheless, chronic undernutrition - low height for age or stunting still remains high compared to other countries in the region. The MICS preliminary results show 32 percent stunting, 18 percent underweight and 5 percent wasting compared to 43 percent, 20 percent and 8 percent respectively in 2004 as shown in the graph below[6].

Figure 6: DPRK - Trends in Child Nutritional Status, 1998 - 2009



Source: Central Bureau of Statistics, 2010. Preliminary Findings of MICS 2009, a joint DPRK/UNICEF survey

Although there is a decline in child malnutriton, stunting rates and undeweight rates are still high; one out of three children is stunted and one out of five is under weight. There is a large variation in stunting among the provinces, ranging from 22 to 45 percent. The highest prevalence is in Ryanggand and Changang (45 percent and 41 percent) and North Hamayoung and South Hamyoung (38 percent). The figure below shows stunting rates in ten provinces.

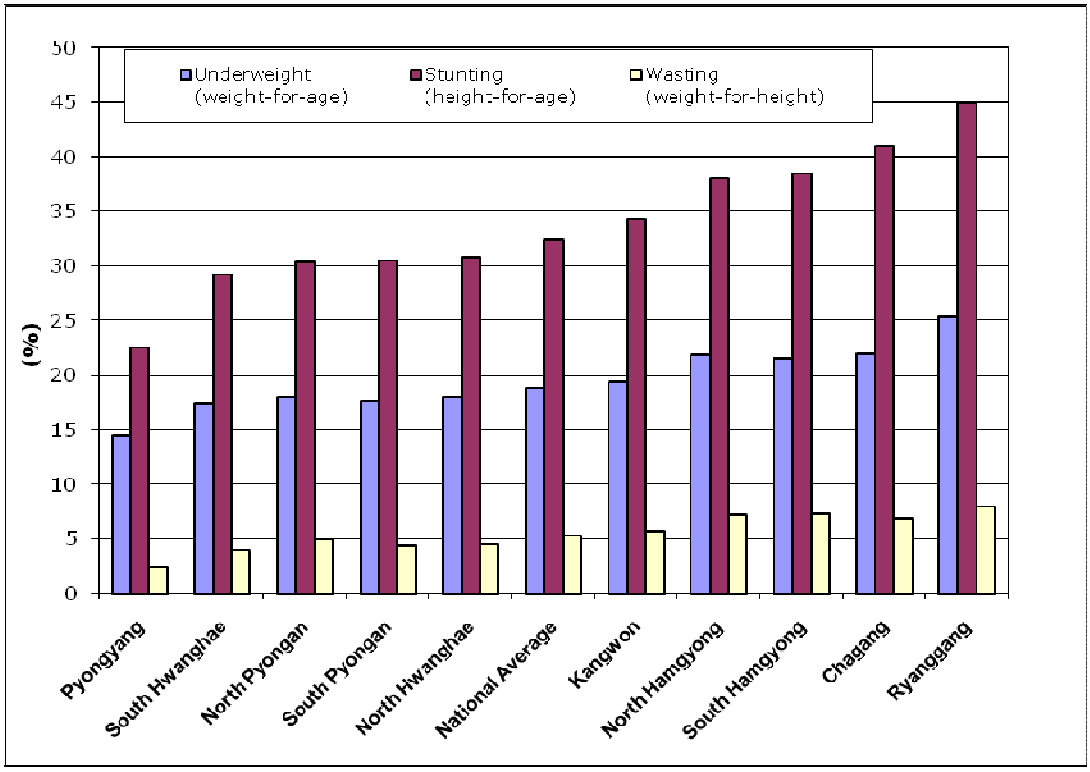
About one in four pregnant and lactating women are malnourished according to the MICS. Maternal malnutrition is associated with child stunting. Malnourished women are more likely to have children that become stunted.

Breastfeeding and in particular exclusive breastfeeding among children 0-5 months is above 90 percent. The prevalence of diarrhoea and pneumonia is 15 percent and 5 percent respectively.

In spite notable improvements in the health sector in recent years, the current levels of infant mortality rate (IMR- 26/1 000) and under five mortality rate (U5 MR-33/1 000)[7] are relatively high. Maternal Mortality Rate (MMR-250/100 000) is also considerably high according to data compiled by WHO/UNICEF/UNFPA and the World Bank[8].

[6] 2004 estimates converted from 1997 NCHS reference to 2006 WHO standard.
[7] Estimates by Inter-Agency Group for Child Mortality Estimation, 2010.
[8] WHO, 2010. Trends in Maternal Mortality: 1990-2008, Estimates Developed by WHO/UNICEF/UNFPA and the World Bank.

Figure 7: DPRK - Nutritional Status by Province



Source**:** Central Bureau of Statistics, 2010. Preliminary Findings of MICS 2009, a joint DPRK/UNICEF survey.

Micronutrient deficiency

Vitamin A*:*

Vitamin A deficiency can lead to increased risk of blindness, morbidity and mortality, particularly in children. Prevention of vitamin A deficiency is a key in child survivial intervention. In DPRK the vitamin A coverage of supplementation of children with high dose is over 90 percent according to the 2009 MICS. Vitamin A deficiency in pregnancy has been associated with an increased risk of maternal morbidity and mortality. Adequate maternal vitamin A stores at birth are needed to ensure that vitamin A level in breast milk are sufficient to protect the newborn during the first six months of life. The coverage of vitamin A supplementation is over 90 percent for post partum mother. This has significantly gone up since 2004.

Anaemia:

Anaemia has a number of adverse health effects in adults and children. Fatigue resulting from anaemia impairs work performance and enduance even for tasks that require only moderate levels of activity. Maternal anaemia in pregnancy increases risk of preterm and low birth weight and subsequent risk of anaemia in the infants. Overall, about 35 percent of the women had anaemia (Hb <12.0g/dl) as reported in 2004. Antenatal and postnatal care seems to be excellent. All pregnant and lactating women are attended by the health professional. Pregnant women receive iron/folic supplements on a regular basis.The prevalence of low birth weight as reported is very low – only 5 percent below 2500gm.

5.4.3 Relationship between nutrition and food consumption

Nutrition is an outcome of two immediate factors, health and dietary intake. In the case of DPRK, there appears to be an inconsistency between the trends in nutritional status of children and food consumption. A large gap in food consumption has been recorded over the years and yet child nutritional status based on the three key anthropoometric indicators (stunting, underweight and wasting) shows improvement as shown by the graph. Worthy noting is that while there has been a large deficit in the overall food supply situation in DPRK, food supplementation for children, pregnant and lactacting women has consistently taken place. In all

kindergartens visited, records showed that these insitutions received food supplements on a regular basis. Further, households with children and pregnant and lactacting women confirmed receiving additional foods in the form of corn soy meals and biscuits. These additional foods plus the child survival programmes in place (such as vitamin A supplementation, folate supplemenation of pregnant women, breast feeding practices and immunisation) are likely to have resulted in reduced rates of malnutrion across the country. There are however, some regions that have quite high levels of malnutrion.

While children and pregnant and lactacting women nutritional status is safeguarded through the humanitarian interventions, the majority of the PDS adult dependents face a large food gap, particularly as this population has a high level of activity – much of the work is manual, with little modern technology.

Most affected by the energy consumption deficits are adults as children, pregnant and lactating have been receiving supplementation. Thus, anthropometric measurements of children are not fully revealing the complete food security issues of DPRK. Children, pregnant and lactating women receive food assistance in the form of supplementary foods and are thus shielded from the chronic deficits. This Mission is unable to classify households by the food security status due to insufficient data as all non farming household receive a ration of cereals. Without reliable information on incomes and income sources by various socio-economic groups, it is not possible to assess the extent to which the various households have access to other foods above the cereals.

5.5 Food assistance requirements

The CFSAM estimates show an overall food supply deficit (import requirement) of 867 000 tonnes of cereal for the 2010/11 marketing year –similar to previous years. If the commercial imports of 325 000 tonnes materialise, the uncovered cereal gap is estimated at 542 000 tonnes. It is therefore expected that households will continue to receive cereal rations from the PDS that are much below their needs and thus under-nourishment will continue for the majority of the population. This large consumption gap is a major concern for the Mission.

The Mission, therefore, recommends the provision of food assistance to the most vulnerable populations. However, due to the inability to classify household by vulnerability, the Mission recommends assistance to vulnerable groups that have special needs - these are populations groups whose needs are determined by their physiological status such as children, pregnant and lactating women and the elderly without the support of relatives.

The justification for targeting these population groups is that in the face of a shock, even of small magnitude, these are the most likely to suffer significantly and with the most negative consequences. Food assistance to the most vulnerable groups will ensure a diet that meets the needed micro-nutrients as well as additional calories to meet their special needs and thus safeguarding their nutritional status.

The Mission further recommends targeting of low income PDS dependent populations, particularly in the northern part of the country and regions with highest level of malnutrition. At this stage based on the key stakeholders and judging from the official 2008 Census statistics, the Mission puts this number just under 2 million people. The individuals to be targeted could be identified more precisely by the family size and the number of income-earning members, for example, households with more than four members and a single earning household member. Other local targeting criteria could be established to ensure the identification of the most vulnerable group among the PDS dependents.

Table 7 shows the estimated number of people to be provided assistance in DPRK for 2010/11 consumption year. The number of people to be assisted is based on the DPRK 2008 population census[9].

[9] Census figures have been adjusted to include only PDS dependents.

Table 7: DPRK - Estimated food assistance requirements for 2011

Target Group	Number of people	Cereal requirement (tonnes)
Children under five 1/	1 046 500	64 000
Pregnant and lactating Women	635 100	39 000
Kindergarten (5-6)	502 500	31 000
Primary Schools (7-10)	754 100	46 000
Elderly 2/ without support	100 000	6 000
Low income PDS dependent in the high malnutrition/ Northern regions	1 950 000	119 000
Total	**4 988 000**	**305 000**

1/ Excludes children of less than six months of age.
2/ Census data of single person households is the proxy for this number.

The above cereal needs are based on a top up ration of 61 kg of cereal per person. This amount of cereal plus the PDS ration[10] will provide about 70 percent of the kcal from cereals, based on the adjusted calorie requirement for this population. The above ration is therefore not sufficient to meet the daily caloric as well as micro-nutrient requirements. The Mission recommends that the total ration to be provided through food assistance includes additional commodities such as fortified blended foods or other multi-fortified foods including complementary foods for small children. As the consumption of complementary foods is low in DPRK, efforts should be made to provide as much as possible soybeans or pulses as part of the food assistance to increase the nutritive content of the diet. Domestic production of soybeans is quite low and does not stretch to adequately cover the entire population.

The recommended food assistance does not fully fill the uncovered gap as estimated in the 2010/11 cereal balance sheet. About 237 000 tonnes would still need to be covered from additional sources to ensure the overall population has access to adequate amounts of food. The continued large consumption gap among the PDS is a major concern and cannot be sustained over the years. A small shock in the future could trigger a severe negative impact and will be difficult to contain if these chronic deficits are not effectively managed. To the extent possible, effort is made by the Government/donors to ensure that the anticipated imports materialize and that efforts are made to procure the additional 237 000 tonnes of cereals for provision through its PDS.

6. RECOMMENDATIONS FOR FOLLOW-UP ACTIONS

6.1 Recommendations related to agriculture

There are some issues relating to crop production, post-harvest technologies and human nutrition which the Mission considers to be particularly important as well as being fairly readily amenable to improvement:

i. **Potato storage:** Over-winter losses of ware and seed potato in DPRK are enormous particularly in the north of the country where winters are particularly severe, with estimates running as high as half a million tonnes of tubers (nearly 25 percent of total production) annually. Traditionally, potatoes have been stored from the end of one season to the beginning of the next in underground bunkers, some of which have a capacity of up to 100 tonnes. In recognition of this very significant production constraint, FAO and other agricultural agencies have focused in recent years on improved storage methods and structures. In a 2008-09 project funded by the Netherlands, FAO, in collaboration with the Ministry of Agriculture and the Academy of Agricultural Sciences, provided eleven cooperative farms in five provinces with improved storage structures. In view of the fact that these have been very successful and greatly appreciated, it is recommended that they and other similar structures of proven utility be replicated in other potato-growing areas. In the meantime the Mission understands that the potato tissue-culture programme is progressing well and in time should reduce the burden of seed storage.

ii. **Drying:** This year with its late rainfall has very clearly emphasized one area of significant loss, both of quality and of quantity, specifically the drying of grain. In late September grain was being delivered to the county warehouses with moisture content in excess of 20 percent. Already some of the grain had deteriorated to the extent of not being usable for human consumption and it is likely that, in the absence of drying facilities, more losses could occur. Many farms rely on air drying with grain laid out on flat surfaces such as roads to dry, and on drying in cribs that have

[10] A top up ration of 61 kg of cereals person is used based on the assumption that the 2010/11 PDS ration is similar to the 2009/10.

been constructed to allow a flow of air. Investigations should, therefore, be carried out into the economics and sustainability of assisted grain-drying.

iii. **Pulses:** The diet of much of DPRK's population is low in protein and for this reason the rapid increase in production (both area and yields) of pulse crops is urgently needed. National production of 154 000 tonnes of soybeans provides about 15 g/day/person. At the same time, the Mission recommends that national and international support be given to increasing production of legumes such as soybeans, peas, chickpeas, other beans and lentils, or facilitate imports in the short run.

iv. **Aquaculture:** Farm fish ponds are already reported to yield very well, producing up to 5 t/ha of fish per annum. On some farms, fish are raised in paddy ponds. Fish protein is of very high quality and contains sufficient amounts of the essential amino acids required for healthy body. Given the generally low protein content of the average DPRK diet the Mission recommends national and international support to increase the area under fish ponds significantly.

v. **Household gardens:** 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*. 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.

6.2 Recommendations related to household food security

i. The Mission recommends that as much as possible effort is made by the Government/donors to ensure that the anticipated imports materialize and that efforts are made to procure the additional 237 000 tonnes of cereals to ensure adequate food supply.

ii. Reliable information on food access is critical to understanding how households are coping with various events. It is therefore recommended that monitoring of the food security situation is established and conducted on regular basis. Such monitoring should be based on random selection of counties, communities and households.

iii. The Mission has recommended the targeting of food assistance to the most vulnerable populations, particularly children, pregnant and lactating women and the elderly without support from relatives as well as low income PDS dependent households. There will be need to conduct regular monitoring and evaluation (M&E) missions to ensure that food assistance programmes are reaching the intended beneficiaries as well as achieving required results. Access to households and communities will be critical to ensuring that M&E information is collected and analyzed.