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AGRICULTURAL POLICY CHANGES IN NORTH KOREA AND INTER-KOREAN COOPERATION

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ABSTRACT

North Korea has suffered widespread food shortages since mid 1990s. North Korea has implemented various agricultural policies to increase it food production through double-cropping, potato production, small animal raising, fish farming etc. Recently its food production has been continuously increased, however international aid is necessary to meet minimum nutritional standard. Even if international food aid is not a long-term solution to North Korean food crisis, it is a viable solution in the short-term. The ultimate resolution to its food problem is to revitalization of its general economy including agriculture. It is necessary for North Korea to normalize the relationship with the international financial institutions and the international community in order to bring in foreign investment, which will fund expansion of its economic infrastructure. Especially inter-Korean cooperation is very important for its economic development and improved foreign relationship.

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Ⅰ. AGRICULTURAL SITUATION IN NORTH KOREA

1. Food Situation in North Korea

North Korea has suffered widespread food shortages as a result of consecutive natural disasters and serious economic difficulties. Food production in North Korea had risen to 4.5 million tons until the late 1980s but since then had shrunken to 2.57 million tons in 2000 and has shown significant increase in 2001 and 2002. Its food self-sufficiency rate started to fall in 1990 and plummeted to the lowest point of 59.7% in 1996 and is now around 75%. Due to its chronic food crisis, the North Korean government cut down the individual food ration to 75% of minimum requirements but there is still a shortage of 1.3 million to 2 million tons every year. Grain demand in North Korea in the 2002/2003 marketing year was 4.92 million tons while grain production is estimated at only 3.84 million tons, leaving a deficit of 0.68 million tons.

TABLE 1. Food Requirement and Shortfall in North Korea

Unit: 1,000 tons

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03
Domestic supply	4,077	2,995	2,663	3,481	3,420	2,573	3,656	3,840
Production	4,077	2,837	2,663	3,481	3,420	2,573	3,656	3,840
Inflow	N/A	158	N/A	N/A	N/A	N/A	N/A	N/A
Requirement	5,988	5,359	4,614	4,835	4,751	4,769	4,957	4,921
Human demand	3,688	3,798	3,874	3,925	3,814	3,871	3,855	3,893
Animal feed	1,400	600	300	300	300	300	300	178
Others	900	961	440	610	637	598	802	851
Shortfall	1,911	2,364	1,951	1,354	1,331	2,196	1,301	1,084
Commercial Imports	700	500	700	300	210	100	100	100
Food aid	630	660	760	840	586	1,532	819	300
Absolute Shortfalls	581	1,204	491	214	535	564	382	684

Source: FAO/WFP, "Special Report: FAO/WFP Corp and Food Supply Assessment Mission to the Democratic People's Republic of Korea," 1996-2002.

To make matters worse, North Korea is unable to purchase the needed food abroad because of the lack of foreign exchange. Therefore it must continue to rely on external food assistance for the bulk of the food needed. However because of a sharp drop in food assistance from the international community, food supply to the vulnerable population is on the verge of Collapse.

In 2002, the government of North Korea, in co-operation with the United Nations Children's Fund(UNICEF) and the World Food Programme, carried out a nutrition assessment in seven provinces and three cities. The nutritional situation in North Korea has improved considerably since 1998. The prevalence of underweight children in the surveyed sample of 6,000 was 20.15%, that of stunting was 39.22%, that of wasting was 8.12%.[2] The overall prevalence of severe wasting was 2.7%.[3] The nutritional situation has certainly improved dramatically since 1998, however, the rates of underweight children and stunting are still high. The survey results show a significant provincial variation. The nutritional situation in city areas is relatively better than in rural areas.

The World Food Programme (WFP) announced 512,000 tons of food assistance for vulnerable groups in North Korea, but it remains 300,000 tons short at this time. The major beneficiaries are orphanages, nurseries, kindergartens, primary schools, pregnant and nursing women, elderly persons, paediatric hospitals, paediatric wards in county hospitals, and food for work. These beneficiaries amount to 6.4 million people. With a break in the cereal pipeline in July 2003, 3 million beneficiaries were dropped from WFP distributions. As well, most spring season Food for Work(FFW) projects were also delayed. In the absence of WFP assistance, some 6.4 million people, most of them women and children, will need to rely on a Public Distribution System that

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[2] United Nations Children's Fund(UNICEF), “Nutritional Assessment 2002 D.P.R. Korea,” Feb. 2003.

[3] Severe wasting is defined as less than 3 z-score weight for age.

only provides them with 200-250 grams of cereal per day. WFP projects that pipeline shortfalls will reach about 65,600 metric tons for the next six months.[4]

Japan, which contributed an average of 300,000 tons during 2000-2001, is engaged in a political dispute with North Korea and has contributed nothing to the U.N. effort in the lasr two years. South Korea, the United States, and EU are major donors. Compared with over twenty countries or collections of aid-givers until 2001, the number of donors has rapidly decreased after the North Korean nuclear crisis. Russia has increased its pledge of food aid for North Korea since early 2003.

According to WFP, rice water and maize weevils have continuously been infested. With insufficient supplies of available pesticides, many farmers are trying to combat the situation by using traditional methods. Affected provinces include North and South Pyongan, North and South Hwanghae, and South Hamgyong. Ryanggang and North Hamgyong Provinces are predicted to have a substantial reduction in maize and rice output due to unfavorable weather conditions this year.[5]

The food shortage in North Korea has resulted from an absolute shortfall of usable resources as well as natural disasters and temporary resource distribution problems and is consequently apt to last for a long time. The main factor contributing to this food deficit is general economic depression caused by the collapse of the communist bloc. The economic depression worsened the shortage of fuel and agricultural materials and the lack of foreign currency makes it harder to import food commercially. In addition to this exogenous factor, North Korean agriculture has many structural problems resulting from the inefficiency of its socialist collective management system.

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[4] World Food Programme(WFP), "WFP DPR Korea monthly update July 2003," Aug. 8, 2003.

[5] ibid.

2. Agricultural Policy Changes in North Korea

Recent changes in in North Korean agricultural policy include 1) increasing the effectiveness of food security, 2) increasing the provision of agricultural inputs, 3) strengthening incentives to the sub-work teams by changing the farm management system, 4) improvement of the agricultural infrastructure, 5) technology development and the spread of new farming practices throughout the country. Such innovative transformations are getting considerable attention from outside in a sense that top political leaders in the country including Kim Jong-il strongly support the policies. Political leaders are acutely aware of the serious food shortage.

2.1. Food Security

North Korean agricultural policies have been directed to resolve the food shortage problem since its establishment. North Korea has steadily carried out projects for environmental reformation to acquire additional arable lands. Despite enormous efforts to achieve food security, the rate of growth of agricultural productivity was very low, and has declined greatly in the past decade.

Structural weaknesses in the economy, worsening terms of trade and reduced availability of foreign exchange have led to declining agricultural production particularly of rice and corn since the end of the 1980s. Land and labor productivity has fallen due to a shortage of agricultural inputs, particularly of imports such as fuel, fertilizer, pesticides, machinery, and equipment. In addition, heavy summer rainfall and the associated flooding in 1995 and 1996 has exacerbated the situation. Food shortage can be expected to continue unless the underlying structural problems are addressed. The continued decline in the food and feed situation has meant a drastic reduction in the number of animals maintained by cooperative farms and individual households.

The new policy to promote the potato as a new major food crop is largely based on the characteristics of potato production, as well as the geographic and climatic conditions of North Korea. The potato is a cool season crop that grows well in

TABLE 2. Major Agricultural Policies under Kim Jong-il Regime

Year	Major agricultural policies
1995	• Converting the cooperative ownership system of farms into the people's ownership system. • Reaching grain production goals through the Juche farming method.
1996	• Turning the corner in grain production with the Juche farming. method, which demands positive and scientific proceedures.
1997	• Increasing rice and meat production through the Juche farming method, which demands scientific proceedures with the farmer's, individual requirements and farm situations. • Launching a nationwide movement for extensive grassland and livestock raising development.
1998	• Achieving abundant rice harvest and meat production through the Juche farming method. • Increasing seed production. • Expansion of double cropping. • Achieving the goals of the Juche farming method in accordance with farmers' needs and farming conditions. • Developing the livestock industry.
1999	• Agriculture is the most important industry for the construction of a strong and prosperous nation. Solving the food shortage problem. • Revolutionary increment of potato production. • Improvement of the agricultural infrastructure on the basis of the "right crop in the right place" principle. • Continual double cropping land expansion and crop seed improvement. • Implementation of the nationwide land rezoning project, including Gangwon Province.
2000	• Implementation of the Juche farming method. • Renewal of agricultural seed production. • Renewal of potato production. • Expansion of double cropping. • Expansion of small animal farming. • Expansion of fish farming. • Continuous implementation of land rezoning projects. • Continuous implementation of national land management including reforestation. • Continuous implementation of the Gaecheon-Taesung waterway project.

Year	Major agricultural policies
2001	• Increasing agricultural production is a basic requirement for the improvement of people's welfare. • Renewal of agricultural seed production. • Renewal of potato production. • Expansion of double cropping. • Expansion of fish farming. • Construction of modern livestock farming. • Continuous implementation of land rezoning. • Continuous implementation of the Gaecheon-Taesung waterway project.
2002	• Successful completion of land rezoning project in South Hwanghae Province. • Successful completion of the Gaecheon-Taesung waterway project. • Expansion of potato production. • Expansion of double cropping.
2003	• Continuous implementation of land rezoning projects. • Renewal of potato production. • Extension of double cropping. • Renewal of agricultural seed production.

highland and alpine areas. It is well suited to North Korean climatic conditions where 70% of the land is mountainous. Therefore, it is ideal to grow potatoes as the second crop of a double cropping system in southwestern areas or as the major crop in northern areas. The potato is considered to be the most appropriate crop for Ryanggang Province, North South Hamgyung and Jagang Provinces. In the current economic context, it is additionally advantageous in North Korea because the potato requires less fertilizer than corn. Potato is a rescue crop in famine because of its high potential yield capacity under adverse conditions. The slogan, "The king of the upland field crop is the potato," is gaining momentum in North Korea. It is expected to be the third major crop along with rice and corn. In the double cropping system, potatoes are produced as the first crop and/or as an inter-planting crop. North Korea has established four major practices for increased potato production:

1) Establishment of tissue-culture facilities for reproduction of virus-free basic plants
2) Dissemination of high quality virus-free seed potatoes
3) Production of high yield elite varieties
4) Improved cultivation methods

The government has permitted farmers to choose the most appropriate crops for double cropping in their area, depending on the climatic conditions, soil fertility, input supply, and other production conditions. After a great effort in the past four years, the expansion of double cropping is again presented as one of the most important agricultural issue this year. The increased emphasis on double cropping is largely due to shortage in food. Thus, the double cropping project is based on a grain-to-grain rotation to increase food grain production. In the case of grain-to-grain double cropping, it is ideal to plant winter barley or wheat in the first week of October and harvest at the end of May or the first week of June the following year to avoid intensive labor requirements for the harvesting and planting.

Double cropping includes potato cultivation in areas having difficulties in grain-to-grain double cropping, such as Ryanggang, Jagang, and North and South Hamgyung Provinces. South of Anju, South Pyongan and Hamheung, South Hamgyung Provinces, where double cropping system has traditionally been implemented, a potato-rice double cropping system is being encouraged along with rice after spring barley and winter wheat. The double cropping area under winter and spring wheat, spring barley and spring potato has increased from 38,000 hectares in 1997 to 191,644 hectares in the 2001/2002 growing season. FAO/WFP estimate that the area under winter/spring crops for the 2001/02 season was 57,270 hectares under winter wheat and 35,630 hectares under spring barley. About 98,744 hectares were grown under spring potato.[6] The double cropped area is likely to

[6] FAO/WFP, "Special Report: FAO/WFP Corp and Food Supply Assessment Mission to the Democratic People's Republic of Korea," Oct. 28, 2002.

expand further under the current economic reform. However, provision of farm power and labor is a limiting factor in expansion of double cropping since the demand for labor and farm power for harvest and planting is very high. These works are seasonally overlapped. As a result, the double-cropped area is unlikely to rapidly expand under the prevailing technological conditions.

The North started the construction of very large stockbreeding farms in many places throughout the country. The North's campaign for building a number of stock-raising farms began shortly after North Korean leader Kim Jong-il gave instructions to that effect during his visit to a goat farm in Hamheung City, South Hamgyung Province, in May 2001. Since 1997, the North has also encouraged farmers to raise small grazing animals. As a result, the number of rabbits, goats, ducks, geese, chicken has rapidly increased (Table 3).

Prior to the floods in the mid-1990s, North Korea had an estimated 900,000 cattle, 3.6 million pigs, 300,000 sheep, 1.1 million goats, and 23 million poultry. Cattle are used for farm work and transport and are collective property, owned by the cooperative and state farms. Pigs, rabbits, goats, and sheep are used for meat production, and poultry for meat and egg production.

North Korea built an array of fish farms with a combined area of nearly 1,000 hectares in 2001. In the past five years, the fish farming area has tripled. Fish production is on a steady rise at the modern catfish farms built in various areas. North Korea began a campaign for the construction of more fish farms in 2000 in an effort to make up for its poor grain production, with a plan to build fish farms covering a combined area of 20-30 hectares in each city and county. About 200 fish farms were expanded or constructed in North Korea in 2000.

One of the big changes with respect to food is that the government of North Korea has dramatically increased grain prices. The procurement prices and Public Distribution System (PDS) prices to consumers both rose through the economic reform of July 1, 2002. The procurement price of rice increased

from 0.8 won to 40 won per kilogram, and PDS price to consumers increased from 0.08 won to 43 won per kilogram. After the economic reform, the role of farmers markets became more important with respect to food price determination and food supply. Although the state still maintains an administered price structure, state prices are being brought in line with those in the market. These changes in prices will increase the amount of food entering the PDS. It will also stimulate an increase in food production productivity if the agricultural inputs are in stable supply.

2.2. Agricultural Inputs

Yield increase can be achieved with sufficient agricultural inputs and advanced technologies. North Korea desperately needs to rebuild its industry to increase agricultural productivity. Shortages of agricultural inputs are one of the major causes of food shortage. Due to the faltering economy, imports of petroleum dropped from 18.8 million barrels in 1985 to 8.06 million barrels

TABLE 3. Livestock Population in North Korea, 1996-2002

Unit: 1,000 head

	1996 (A)	1997	1998	1999	2000	2001	2002 (B)	B/A
Oxen	615	545	565	577	579	570	575	0.93
Pigs	2,674	1,859	2,475	2,970	3,120	3,137	3,152	1.17
Sheep	248	160	165	185	185	189	170	0.69
Goats	712	1,077	1,508	1,900	2,276	2,566	2,693	3.78
Rabbits	3,056	2,740	2,795	5,202	11,475	19,455	19,482	6.38
Chicken	8,871	7,547	8,965	10,371	14,844	15,804	17,259	1.95
Duck	1,098	822	1,372	1,624	2,078	3,158	4,189	3.82
Geese	554	357	462	829	889	1,090	1,247	2.25

Source: FAO/WFP, "Special Report: FAO/WFP Corp and Food Supply Assessment Mission to the Democratic People's Republic of Korea," Oct. 28, 2002.

in 1995 and raw material supply drastically declined causing the provision of agricultural imports to fall into crisis.

During the 1970s and 1980s, North Korea experienced great success in agriculture as a result of high-density planting and extensive use of fertilizers. These methods however, proved to be detrimental to the natural soil balance and subsequently brought on such negative side effects as soil fertility deterioration. International organizations have urged North Korea to decrease its planting density and use less fertilizer to restore soil balance. Following that advice is a positive step for the North from a long-term perspective. The reality of the present food crisis, however, gives North Korea no choice but to use more fertilizer in order to increase food production.

The level of chemical fertilizer used in the North was similar to that of the South until the 1980s. During the 1990s, however, the North Korean economy began to stagnate, and the chemical fertilizer consumption in the North has become much less than that in the South. It is estimated that the average consumption of fertilizer in North Korea would be 600,000 tons (NPK nutrient equivalent) per year in the 1980s. In 1998, the total supply of fertilizer was 124,000 tons of NPK nutrient equivalent; 47,000 tons from self-produced fertilizer and 77,000 tons from imports or aid. In 2001, the availability of fertilizer amounted to 190,000 tons of NPK nutrients equivalent, about 17 percent more than in 2000. In 2002, the availability of fertilizer amounted to 189,000 tons of NPK nutrient equivalent, about 1,000 tons less than in 2001. The actual fertilizer availability and application rates of NPK nutrients remain about half of the levels recorded before 1989. About 73 percent of fertilizer availability for the country was covered by donations from the international aid community (mainly from South Korea and the EU). The domestic production capacity of the three manufacturing plants (Namheung, Heungnam, and Aoji), which continue to suffer not only from obsolescence, but also from extreme shortage of raw materials and spare parts, has further declined. In 1999, these fertilizer

production units were still able to produce some 30 percent of the applied nutrients however domestic production accounted for only 14 percent and 8 percent of the total availability in 2001 and 2002 respectively. A total of 300,000 tons of fertilizer contributed from South Korea in 2002, which is not included in the official statistics, will be very helpful in the 2002/03 season. South Korea provided 200,000 tons of fertilizer in 2003.

Fertilizer application rates to paddy and corn have increased in 2002. It is estimated that some 70 to 80 kg (nitrogen equivalent nutrient) per hectare were distributed last year to the main cereal crops in the form of Ammonium Sulphate, Urea, and several NPK combinations. The FAO agricultural specialists estimated that the 15 to 20 percent increase in last year's yield results was to be attributed to the increased and timely NPK nutrient applications at critical stages. The cooperative farming units have also improved their efforts in producing organic fertilizer providing some 20 to 30 tons per hectare of farm yard manure. The use of organic fertilizer and of on-farm produced bio-pesticides is being greatly emphasized by farm managers for their beneficial long-term effects, resulting in less reliance on fertilizer imports.

2.3. Farm System

Agricultural reform in North Korea is a requisite process not only to overcome the current food shortage, but also to ensure economic reforms. The government started to introduce a new sub-work team system to motivate farmers to increase production in 1996.[7] The old sub-work team consists of 10 to 25 farmers

[7] The sub-work team on cooperative farms originates from an instruction given by Kim Il-sung when he visited Pochon Cooperative Farm in 1965. Under the system established the next year, the 150 man work team was broken down to sub-work teams with 25 members each to enhance farmers' collective responsibility and increase their productivity. But the system has not paid off because of excessive output assignments and too few incentives given to the teams.

where member receives the allocation of products according to his or her work-days measured by the amount of production. From the very beginning in the early 1970s, however, this system has been challenged by many side effects such as overrated work performances in return for large allocations and inappropriate member production goods. Inefficiency embedded in this system is therefore blamed to worsen the agricultural condition. A few changes have been made to give incentives to the members in a sub-work team (Table 4). Key changes include 1) decreasing the number of members from 10 to 7 adjusting production goals so that they can we more easily, exceeded, and 3) allowing the members to dispose of the products in excess of the assigned production by themselves.

With fewer members, a sub-work team unit can comprise only family members or close relatives. This new structure can give opportunity to unify labor forces when natural disasters occur. A new quota system has been introduced to give incentives to farmers. The work-teams on cooperative farms are allowed to manage excess products beyond the production quota for private purposes. The unique feature of the new sub-work team system is that the products exceeding the production target at a given cooperative farm is not contributed to the farm, but rather given to the team members' at their disposal. Most of times, surplus volume is disposed of at the farmers' market, where market prices are over 100 times the government purchase price. However, a key problem underlying the system is how to accomplish the production goal under existing economic difficulties.

It is generally recognized that the adjustment of the sub-work team system will have positive effects on farmers' incomes. However, the new sub-work team system failed to motivate farmers. North Korea's attempt to increase agricultural production by introducing a new sub-work team system has not been realized because the incentive system has not been operated effectively without an appropriate supply of agricultural inputs and infrastructure. But, the structural change is now regarded as

a viable tool to achieve an increased level of production by means of competition among teams and expanding incentives. The new sub-work team system is expected to be effective under the new market system. The North Korean government switched to a market system in March 2003. The name of the previous 'farmers market' was changed to 'market' or 'local market'. Food trade was not allowed under the farmers market system however, almost every item including food is possible for trade under the new market. The change in market systems is expected to yield positive effects on the new incentive system of cooperative farming.

2.4. Agricultural Infrastructure

The Rodong Shinmun reported on July 28, 1998 that the land rezoning project, which originated from Kim Jong-il's "Natural Remodeling Policy," would be an important alternative to increased agricultural production. In fact, land rezoning was already identified in October 1976, in the 5th term, the 12th plenary session of the Central Committee of Worker's Party, as

TABLE 4. Changes in Sub-work Team Management System in 1996

	Old sub-work team system (1966-95)	New sub-work team system (1996)
Composition	10-25 members who are mixed according to capability and requirement	7-10 members who mainly consist of family or neighbors
Production target	Set by the government every year	Set by averaging out the recent 3 year average production and the preceding 10 year average production
Disposal of extra volume	• Target production is supplied to the government • Extra production volume is also purchased by the government at government purchase prices	• Target production is supplied to the government • Team members dispose of the extra volume by themselves

Source: Chosun Shinbo, April 14, 1999.

one of the "Five Lines of Nature Remodeling," along with irrigation, construction of terrace fields on hillsides, tideland reclamation, and anti-flood forestation. The plenary session then set goals to search and discover new farmland of over 200 hectares for each county, a total of 100,000 hectares nationwide.

Reflecting Kim Jong-il's policy, North Korea began to rezone cultivated land in October 1998, starting with 30,000 hectares of cultivated land in Gangwon Province, followed by 50,000 hectares of cultivated land in North Pyongan Province from January 1999 through May 2000.

North Korea kicked off the second phase of a cultivated land rezoning project in South Hwanghae Province last fall, with "shock brigades" participating from throughout the country. The North began the first phase work covering an area of 50,000 hectares in October 2000 and completed it in April 2001. The second-phase rezoning of the remaining 50,000 hectares in the province was completed in April of this year when Pyongyang celebrates the 90th birthday of the late former North Korean leader, Kim Il-sung, on April 15.

The main focus of the land-rezoning project was on combining many small, parceled paddies or fields into large ones, and on developing unused land adjacent to railroads, waterways, and rivers. The rezoning of cultivated land in the North is aimed at spurring agricultural mechanization and rooting out the North Korean farmers' adherence to land ownership.

North Korea regards improvement of land fertility as a prerequisite to intensive agricultural methods. Although soil fertility can be maintained by a crop rotation system that prevents soil depletion caused by single crop cultivation, the North decided not to adopt the system because of its limited arable farmland. Instead, it chose intensive agricultural methods, emphasizing the importance of soil fertility as a precondition. North Korea encouraged the use of soil improvement materials such as slaked lime and carbide, while simultaneously taking advantage of traditional methods such as organic fertilizer application, transportation of soil from more fertile areas, and

deep plowing.

North Korea desperately needs to improve soil fertility to ensure success of its policy to expand double cropping and increase potato production. Given the lack of chemical fertilizer, North Korea is encouraging an increase in self-produced fertilizer in the sprit of self-reliance, and is also turning more toward organic fertilizer and microbial fertilizers to improve soil fertility.

North Korea finished the Pyongnam Irrigation System in 2002. It initiated the Pyongbuk Irrigation System immediately after. This project has a dual aim of increasing agricultural production while at the same time conserving energy supplies. It is located in the country's prime grain-producing area and consists of nearly 100 cooperative farms. Under the project, a new reservoir with a storage capacity of 275 million tons of water will be formed through the construction of a 650 m long dam on the Samgyo River. North Korea drew a $10.2 million loan from the OPEC Fund for the project. Water will be drawn from the reservoir via a separate outlet tower that will be built 1,500 m upstream, replacing the existing pump-driven system with one using gravity-fed technology. Some 64 km of new canals will be built and connected to the existing canal system which will be rehabilitated.[8]

2.5. Technology Development

North Korea has developed new technologies in cooperation with international communities to increase food production since the food crisis in the mid-1990's. The major changes in agricultural technology are 1) to increase rice production with less inputs, 2) to establish double cropping of barley or wheat with rice by shortening the growing period in the main fields, and 3) to minimize the impact of floods.

A joint program by the United Nations agencies and the

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[8] OPEC Fund for International Development, "OPEC Fund extends US$10.2 million loan to Korea DPR in support of irrigation improvement project," Oct. 29, 2002.

North Korean government was introduced in 1996 to develop a double cropping system. The proposed system consists of barley and corn, winter wheat and vegetables, or spring barley and rice. It is expected a that the spread of the double cropping system could mitigates a food shortage in spring. About 38,000 hectares of double cropping crops were planted in 1997. In 2002/03, the double cropping acreage substantially increased to 210,000 hectares. The technical validity of the plan however, does not appear to have been established fully. Problems have yet to be overcome including additional fertilizer requirements, early barley and wheat growth as previous rice crops cannot be harvested without mechanization, and pest carryover.

To deal with the problem of food shortage through agricultural restructuring, reformation of the collective farming system and the introduction of incentive programs for farmers cannot be overlooked. As long as the government controls all economic activities from production to consumption and does not allow farmers to pursue their profits, an increase in agricultural production will be unrealized.

According to the forecast based on recent statistics, corn yield can be increased by at least twofold if sufficient fertilizers are supplied. In the past three years, corn yield was less than 2 tons per hectare mainly due to severe drought and flood in addition to the poor quality of seed, a low level of technology, and an inefficient economic system. Privatizing the collective farms can double the level of agricultural production. China, for example, doubled its agricultural output by reforming agricultural policies in the 1970s. Economic reform and liberalization also helped Vietnam to substantially increase its agricultural productivity and thus change into a net exporting country that ships about 2 million tons of rice to world markets every year. The food situation will be further aggravated if the North insists on the Juche farming method and the collective farming system.

Recently North Korea has been interested in improving vegetable cultivation. The level of fresh vegetable consumption during the winter is very low because of its lack of greenhouses.

The numbers of germ-plasm and varieties are very limited, and cultivation technology is still at a low level. Planting materials such as seed, plastic film, fertilizer, and manure are not available in most areas. Planting protection technologies such as chemical control are poor.

II. THE CURRENT STATUS OF INTER-KOREAN AGRICULTURAL COOPERATION

1. Types of Agricultural Cooperation

In the previous chapter, agricultural restoration in North Korea and international support for such restoration were discussed. Due to lack of support from the international community, the agricultural development plan has not produced substantial benefits yet. Accordingly, agricultural reforms and expansion of agricultural output in North Korea are being delayed. In order to minimize the side effects of a prolonged downturn in the North Korean agriculture, international assistance and cooperation is necessary for its agricultural restoration (Table 5).

However, cooperation without firm principles is meaningless. There are many types of agricultural cooperation, and each determines the main parties involved and approaches to be taken. Agricultural cooperation between the two Koreas can be broadly classified as agricultural cooperation for public benefit and for commercial cooperation.

Agricultural cooperation for public benefit can serve as a useful vehicle to directly support North Korea's Agricultural Rehabilitation and Environmental Protection Plan (AREP). This could include cooperation aims to assist North Korea to rebuild its agricultural sector and to ultimately find a way for the two Koreas to gain mutual benefits in the sector. This can be accomplished by supporting North Korean agriculture to enhance production output or by exchanging agricultural technology. Various actors can participate this cooperation: the government, NGOs, and academia.

Commercial cooperation, on the other hand, is clearly separate from public cooperation as South Korean parties involved seek economic profit through agricultural cooperation with North Korea. Therefore, this is the type of agricultural cooperation, which private firms can effectively conduct. Commercial cooperation includes trade of agricultural goods and agricultural investment projects to jointly set up and run agricultural firms.

Public cooperation projects have significant meaning in that they directly support North Korea in setting up an agricultural infrastructure, given the current economic difficulties of the North.

Table 5. Types of Agricultural Cooperation Between the Two Koreas

Type of cooperation		Main actor	Major projects	Government's role
Public cooperation	Agricultural support and technology cooperation	NGO	Small agricultural support projects Agricultural technology exchanges project	Technical and financial support
	Agricultural rehabilitation and development support	Government	Restore agricultural facilities Reforestation	ODA method
Commercial cooperation	Trade in agricultural products	Private sector	Trade agriculture related goods	Institutional infrastructure
	Joint operation of agricultural firms	Private sector	Produce agricultural goods based on contract Investment with agriculture related industry	Institutional infrastructure

2. Current Status of South Korean Agricultural Assistance

2.1. Assistance of South Korean NGOs

Support by the private sector started as humanitarian support such as food, clothes and medicine, but it recently moved toward cooperation to enhance production capacity of North Korean agriculture and restore the environment. Humanitarian support has been actively provided by the South Korean Red Cross, religious organizations and other welfare organizations. Support for agriculture and environmental rehabilitation in North Korea has been initiated by private organizations(Table 6).

Since 1998, the South Korean government has gradually lifted regulations on support by the private sector to the North. This year, the government also started financial assistance to private organizations supporting the North and support projects, by providing the Inter-Korean Exchange and Cooperation Fund. NGO support to the North in the agricultural sector is expected to continue to grow, backed by the strong enthusiasm of the private sector and government support. To this end, it is necessary to define a more professional approach to ensure more efficient private-public cooperation, and thus, to qualitatively expand agricultural support by the private sector.

2.2. Government Assistance to North Korea

Since 1995, government support to the North has been mainly humanitarian emergency support such as food and medicine, but from 1999, support shifted toward aiding the North to secure viability. A prime example is fertilizer support. Other than fertilizer, the government has indirectly provided agricultural facilities and material through the UNDP and the FAO. In addition, aside from humanitarian and emergency food support, the government provided food through the WFP, to indirectly support irrigation projects to restore agriculture and forestry in the North.

In March 2000, President Kim Dae-Jung fully committed the South Korean government to supporting North Korean

agriculture through the "Berlin declaration." This includes support for agricultural facilities and technology, as well as for agricultural infrastructure such as irrigation facilities. If such commitment by the South Korean government is to be fully realized through dialogues with the North, it may pursue direct or indirect participation in agricultural development plans with the North. In order to succeed, there should of course be more talks between the two Koreas.

TABLE 6. South Korean NGOs' Assistance to the Agriculture and Forestry in North Korea

Name of organization	Year	Major activities	Funding sources	Future concerns
Forests for Peace Inc.	1999-	• Providing seeds, saplings, fertilizers, pesticides, expertise and technology for erosion control • Promoting academic exchange of forestry specialists	Private donations	Renovation of tree nurseries Research exchange
Good Neighbors	1995-	• Project on the milk cows (1998-) • Project for children's hospital (2001-) • Project on children's residential institution (2000-)	Private donations Gov't	Assistance to orphanages all over North Korea
Good People World Family	1999-	• Providing corn seeds and fertilizers • Lunch program for primary schools	Private donations Church	Education for unification
Join Together Society (JTS Korea)	1997-	• Providing therapeutic mix for children • Agricultural assistance	Private donations Gov't	Agricultural improvement of techniques
Korea Food for the Hungry International	1994-	• Sending powdered milk • Medical equipment • Construction and management of fertilizer factory • Hydroponics and dairy goat program	Private donations	Expanding agricultural development projects

Name of organization	Year	Major activities	Funding sources	Future concerns
Korean Sharing Movement	1996-	• Food and general donations • Agricultural technology • Goat support program • Lunch for children	Private donations Gov't	Health and Medicine program
National Coalition of NGOs for Inter-Korean Agricultural Development and Cooperation	1998-	• North-South cooperation on growing seed potatoes • Operation of an information center for North-South agricultural exchange	Private donations	Promoting the awareness of agricultural cooperation
National Council of Saemaul-Undong Movement in Korea	1998-	• Agricultural assistance (cooperative farm project, sending the unification hand-drawn carts and insecticides) • Winter clothes	Interest income from general fund	Community development campaign
World Vision Korea	1994-	• Noodle factory program (1996-) • Vegetable greenhouse farming (1998-) • Seed potato program (1998-) • Medical recovery project (1999	Private donations Gov't	Hydroponics greenhouses

Lee, Keum-soon, "Assisting North Korea by Intergovernmental Agencies and Non-Governmental Organizations: Current State and Implication," paper presented at an International Organizations' Assistance to North Korea and Inter-Korean Cooperation, Sep. 7, 2001.

3. The Current Status of Commercial Cooperation Between the Two Koreas

3.1. Agricultural Trade

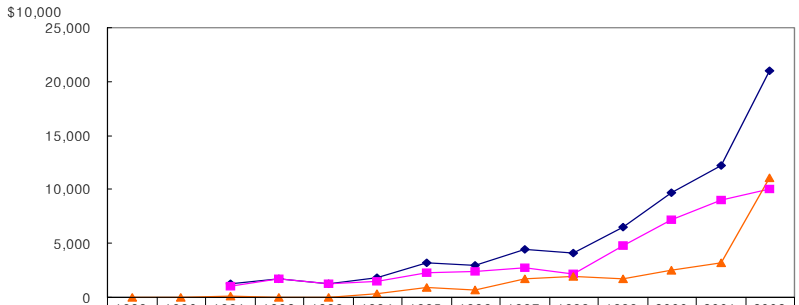
Trade between the two Koreas in agriculture, forestry and fisheries dramatically increased almost ten-fold over the past ten years, from 12.4 million dollars in 1991 to 210.1 million in 2002. In particular, the most recent three years showed steep growth.

The proportion of total trade volume taken up by agriculture, forestry and fisheries is on a steady increase from 11.2 percent in 1991 to 32.7 percent in 2002.

Most noticeable in trade between South and North Korea is imports. Imports of agricultural, fisheries, and forestry goods increased more than 9.2 times, from 10.8 million dollars in 1991 to 99.9 million dollars in 2002. Exports of agricultural products increased more than 16.9 times for the same period. However, recent import trends show that only three or four items maintain an annual average import volume of more than one million dollars, which is clear evidence that agricultural, fisheries, and forestry trade between the two Koreas still remains unstable.

Although there have been fluctuations, the inter-Korean relationship is continuing to improve. In response to such changes, it is necessary to redefine the position and strategies regarding the import of North Korean agricultural goods. Regarding imports of North Korean agricultural, fishery, and forestry products, the South Korean government is currently taking two different positions: that of the government; to give more weight to improving the inter-Korean relationship and that

FIGURE 1. Annual Inter-Korean Trade of Agricultural, Fisheries, and Forestry Products



	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total			1,243	1,697	1,208	1,857	3,163	3,017	4,435	4,144	6,554	9,731	12,230	21,009
Import			1,082	1,691	1,202	1,525	2,232	2,346	2,733	2,180	4,787	7,193	8,981	9,990
Export	–	1	161	6	7	332	931	671	1,702	1,964	1,767	2,538	3,249	11,019

Source: KREI, Trends of North Korean Agriculture, Vol. 5, No. 1, April 2003.

of domestic industries; which is to prioritize the domestic economy and stabilize domestic farmers' incomes. From the former perspective, the policy priority lies in facilitating exchanges between the two Koreas. To regard the import of North Korean agricultural goods as domestic trade is representative of the policy toward North Korea. From the latter point of view, on the other hand, the government has to implement a policy to limit the import of agricultural goods, which may impact the domestic farmers, a position, which is reflected in the regulation on imports of North Korean agricultural, fishery, and forestry goods.

Maintaining two such contradictory policies has advantages in that it ensures a flexible response to possible problems arising in the future, when small amount of products are imported. In particular, the import approval system can serve as a vehicle to check and prevent third-country products falsely labeled as North Korean from being imported into South Korea. However, when the trade volume between the two Koreas grows in the coming years, these contradictory policies may lead to further confusion. Therefore, it is necessary to redefine the strategies and systems regarding import of North Korean goods.

On the other hand, export of agricultural, fishery, forestry products to North Korea is on a steady rise, as is shown by Figure 2, but these are mainly through humanitarian aid. From a commercial perspective, the general environment for export is still at an immature stage, and the commercial export of agricultural goods is not likely to increase in the short term, at least until the North Korean economy overcomes the current food shortage.

3.2. Agricultural Investment Projects

There are only two commercial investment projects to North Korea that have been approved and implemented up to now in the agricultural, fishery, and forestry industries; the Doorae-Maul Agricultural Cooperative established a joint venture operating a farming village and contract cultivation project, and Baeksan

Corperation operated a joint venture, the mushroom-cultivation project, both in the Rajin-Seonbong area. However, both projects are on hold, since the temporary shutdown of the Rajin-Seonbong Free Trade Zone in 1998.

The most important element for successful agricultural investment in North Korea is to establish infrastructure. Since agreements have been signed on investment guarantee, double taxation avoidance and dispute settlement, it is safe to say that systemic infrastructure has begun. But, substructure for trade, such as transportation and telecommunications have not been fully established. Moreover, neither secure payment methods to facilitate investment and trade, nor a system to guarantee country of origin have been put in place.

Equally important is mutual understanding between the two Koreas and further expansion in exchanges between the two. To accomplish this goal the two Koreas must accumulate a great deal of expertise through various contacts as well as experience. Sufficient experience can be gained through agricultural support, trade in agricultural products and import and export of agriculture-related goods. In addition, a thorough investigation is vital to determine whether a market exists for products generated from agricultural investment projects to North Korea.

It takes a substantial amount of time and effort to meet such requirements. Therefore, investment projects in the North Korean agricultural sector are expected to focus on support projects for the near future to identify further opportunities.

III. PROSPECTS OF AGRICULTURAL COOPERATION BETWEEN SOUTH AND NORTH KOREAS

1. Direction of Agricultural Cooperation

The long-term objective of inter-Korean agricultural cooperation is to find a way for the two Koreas to gain mutual benefit in the agricultural sector. But for the present, more emphasis should be put the on social stability and agricultural restoration of North

Korea rather than on economic profit of South Korea. To ease the tension between the South and North, South Korea should consider both tangible and intangible effects resulting from economic cooperation instead of only economic profit. While persuing agricultural cooperation with the North, South Korea should pay attention to maintaining continuity of the cooperation by developing it in a gradual manner. On the short-term basis, assistance for agricultural supplies or facilities is desirable because such assistance is likely to be easily accepted by North Korea and requires little human exchange. On the mid-term basis, cooperation programs in the form of project and technological exchange, which require human and material exchange, are advisable. On the long-term basis, large-scale projects including establishment of agricultural infrastructure, which require large amounts of capital and active human exchange, are appropriate.

Various forms of cooperation using each their own advantages can maximize the effect of inter-Korean agricultural cooperation. Agricultural cooperation can be subdivided into commercial trade, assistance of agricultural inputs and technological exchange, and agricultural rehabilitation and development assistance. From a long-term view, awareness that assistance is integral to cooperation is essential. The private sector is able to conduct small-scale cooperation projects such as commercial cooperation, assistance of agricultural inputs and technological exchange however projects like agricultural rehabilitation and development are not feasible. Therefore the government must participate in development cooperation with the interest of North Korean agricultural development.

Civilian agricultural cooperation project between South and North Korea is divided between commercial trade revitalization, agricultural cooperative investment and food and material aid. Trade between the two Koreas in agriculture, forestry and fishery has dramatically increased almost ten fold over the past decade. The trade volume of agriculture, forestry and fishery products accounts for 30 % of total trade volume. To revitalize trade, the two government should first address trade issues such as

Certificates of Origin, retrenchment of logistics costs, third-country agricultural products represented falsely as North Korean goods, establishment of machinery for settling trade disputes and improvement of import systems and management methods. In spite of much interest taken through civilian cooperation and investment projects in North Korean agriculture in their early stages, only a few projects are actively being implemented. Because neither dispute settlement machinery nor institutions have been established yet, the civilian cooperation projects cannot operate well. Civilian support projects for North Korean agriculture include relief food assistance and food and material aid for rehabilitation or development of agriculture. At first, civilian assistance to North Korea focused on food aid and then extended to support for agricultural rehabilitation. And recently it has been changing into support for agricultural development. Support for agricultural rehabilitation and development usually involves provision of agricultural materials including fertilizer, agricultural chemicals and machinery. The agricultural development support projects are usually implemented as small-scale model projects and serve as a pre-stage for agricultural cooperation and investment projects. The agricultural development support projects preferred by North Korea include material and facility support for production of seed potato, provision of silkworm and sericulture equipment, provision of female goats and materials for model stock farms, provision of agricultural supplies and greenhouse for vegetable production and support for reforestation.

Until full-scale cooperation on the governmental level begins, indirect support through private organizations or public corporations is needed. However, when the cooperation project between the two governments is carried out, the South Korean government's role in North Korean agricultural development will become more important. The cooperation project on the governmental level can be classified into indirect support, direct support, governmental cooperation and exchange and credit projects. The direct support includes aid for double cropping, aid for modernization of seed, support for controlling natural disasters

or pests, provision of sericulture equipment and idle spinning facilities and support for controlling forest pests and repairing tree nurseries. The government can support the cooperation project in many indirect ways; it can provide financial aid for private organizations which participate in small-scale agricultural cooperation projects; it can also provide long-term and low-interest loans for public corporations which support storage and processing facilities for agricultural products in North Korea; it can also participate in trust projects sponsored by international organizations. The governmental cooperation and exchange project includes exchange of agricultural technology and experts, exchange of information on genetic resources, establishment of overseas joint sales networks or markets for agricultural products. In regard to credit projects, higher priorities are put on credit that provides food or fertilizer to relieve temporary overstock, credit that transfers unused agricultural material production facilities to North Korea, long-term and low-interest credit that finances construction of agricultural product processing factories and storage facilities as well as long-term credit to finance improvement of irrigation systems. The South Korean government should pay attention to making long-term plans for the revitalization of inter-Korean agricultural cooperation, laying systematic groundwork and coordinating the roles of actors in cooperation projects. In addition, the government needs to expand the infrastructure for agricultural trade between the two Koreas and make diplomatic efforts to help North Korea join international financial organizations.

2. Possible Measures to enhance Agricultural Cooperation

A most urgent issue in North Korea is to develop its agriculture to mitigate food shortage. Fundamental factors for increasing agricultural output include agricultural infrastructure and to reform farm management systems. However, the North does not have sufficient resources to plan its own agricultural development strategies well enough to execute.

In the short-run, the most pressing priority in agriculture is

to provide necessary inputs such as seed, fertilizer, pesticides, and for machinery fuel to existing cooperative farms. The desirable mid-term plan is to develop an agricultural input industry including seed and feed production, a fertilizer and pesticide industry, technology development, and farm machinery improvements. It is extremely important to establish a seed improvement program such as a seed multiplication program and a seed distribution program. In the long-run, following large-scale projects are recommended: reforestation, terrace plot restoration on slopes of mountains, readjustment of orchards and mulberry land, irrigation system development, and water development.

In reforming the agricultural system in North Korea, foreign aid, and economic cooperation, especially with South Korea and western countries, can be valuable resources. The cooperation between the two Koreas, in particular will improve the food crisis in the North by restoring confidence, and by raising agricultural productivity. Western NGOs including those of the European Union and the United States will contribute to rehabilitate North Korean agriculture. Ties with foreign countries can play a vital role to help it escape from its economic predicament. Aid to the North should be directed as assistance of fertilizers, pesticides, and other agricultural inputs from short-run direct food aids. Through support of agricultural inputs, the North will be able to utilize its agricultural resources more effectively. It can produce more in the long-run with input aids than with direct food aids. Furthermore input aids will be more acceptable to the South than direct food aids

South Korea and other neighboring countries can play an important role in developing North Korean agriculture where support from China, Russia, the EU, the U.S and Japan is key. Neighboring countries must foster a mood where the two Koreas continue dialogue, and provide economic and diplomatic support to help North Korea join the globalization trend. Through Official Development Assistance (ODA), each country can provide North Korea with capital, materials and technology in forms of support such as agricultural trainee invitation programs, material aid

programs, agricultural expert delegation programs, development fact-finding missions and NGO aid programs.

The agricultural development support project for North Korea, which has been implemented by the international organizations, seems to be opportune and its results are highly appreciated. Through the agricultural development support project, the international organizations encourage North Korea to join the international community and give it opportunities to learn basic principles of the international community. Since the agricultural development support project follows a very systematic process of planning, implementation, problem recognition and post evaluation, it could substantially help North Korea to plan and/or implement agricultural investment in the future. It may also have the effect of training specialists in the field. To renew North Korean agriculture, technological aid as well as rehabilitation and expansion of the agricultural infrastructure, reconstruction of the agricultural material industry, a raise in farmers' incomes and low-interest credit from international financial institutions is vital.

The two essential factors for increasing agricultural output in North Korea, i.e., systemic reform and establishment of infrastructure, cannot succeed without the other. Even though North Korea introduced a “new sub-work team management system” in 1996, (an attempted reform to enhance farmer motivation, without necessary infrastructure support,) it has failed to increase agricultural output.

North Korea understands the need to strengthen its weak infrastructure with the support of the international community, and has consequently developed a mid- to long-term development strategy for agriculture. Announced as the Agricultural Recovery and Environmental Protection (AREP) plan, it was implemented in 1998, and backed by the UNDP. North Korea and the UNDP were able to get support from the international community by holding a round table conference with international organizations, national governments, and international NGOs. This support however, fell far short of meeting North Korean requirements in terms of amount or support quality. Currently, it is assumed that

the AREP plan is not being implemented as it was originally planned.

Agricultural cooperation and exchanges between the two Koreas are broadly classified into public cooperation and commercial cooperation. The former is agricultural support from the government or NGOs while the latter is trade of agricultural goods by commercial firms and agricultural investment projects. Given the current economic situation in North Korea, public agricultural cooperation must be made a priority. The government's commitment for agricultural support has already been highlighted in the Berlin Declaration. A a result, agricultural cooperation on the government level is expected to be facilitated in accordance with further development in talks between the two Koreas.

Yet, enhancing the viability of North Korean agriculture by facilitating the economic cycle through commercial cooperation, cannot be ignored either. Important to commercial exchange is the development of current import policy on North Korean agricultural products. Appropriate measures must be taken in order to set the government policy toward North Korea in harmony with domestic industrial policies. Until the overall agricultural investment projects situation matures, the future remains unclear.

Ⅳ. CONCLUDING REMARKS

Even if aid is not a long-term solution to the North Korean food crisis, it is a viable solution in the short-term. The ultimate resolution to the North Korean food problem is to revitalize its general economy including agriculture. Increasing productivity of food production through strengthening economic incentives to farmers is one of the fundamental solutions. However, inflow of materials and capital from the outside world is a prerequisite factor for economic development.

To escape the dire poverty, North Korea should attract foreign capital and increase investment in the agriculture, fishery and forestry sector in the light of competitiveness and

contribution to its own economy. However, since North Korea is expected to have trouble in raising large-scale funds, it is desirable to invest in the agriculture, fishery and forestry sectors which can make the most of land and labor, the country's main resources. Considering its present economic situation, the food industry is the one that North Korea should expand through investment and should be developed as a strategic export industry. In the light of the development experience in South Korean agriculture, North Korea has to create alternative income sources for farmers and develop strategic goods to foster export agriculture.

North Korea must abandon the complete food self-sufficiency for long-term food security. A major objective of its agricultural policy should be emphasized to supply sufficient food for peoples' balanced nutrition. Considering agricultural resources, it should target around 70 percent of food self-sufficiency instead of 100 percent. However, in order to secure required food from the limited domestic arable land, it is necessary to expand double cropping area and potato cultivation, which will raise farmland usage ratio. The country Should also promote crop diversification to provide its people with balanced nutrition by reducing the cropping proportion of corn and instead increasing the production of soybean and vegetables.

In order to develop the agricultural sector, growth in the overall economy including recovery of related industries is inevitable. And in particular to deal with the shortage of agricultural supplies, related industries such as seed, fertilizer, agricultural chemicals and plastic film, must be normalized. Moreover, to operate agricultural machinery again, which was left unusable due to the lack of electricity and fuel, North Korea must earn foreign exchange. To continuously increase agricultural productivity, the Juche farming method and agricultural management organizations and institutions should first be improved.

It is necessary for North Korea to normalize its relationship with international financial institutions and the

international community in order to bring in foreign investment, which will fund the expansion of its agricultural infrastructure. To adapt to globalization, North Korea should improve related institutions immediately to liberalize its economic management system and turn it into a market-oriented system. In these respects, North Korea's economic reform, its "economy management improvement measures" taken on July 1 2002, and its designation of three economic special zones, "Sinuiju Special Administrative Region", "Kaesung Industrial Park" and "Kumgang Mountain Tourism Region" are expected to be its first step toward open economy. The projects to reconnect cross-border railways and roads will give economic benefits to the two Koreas. In this context, strengthening economic cooperation between the two Koreas is most important for its economic recovery. And successful negotiation of multilateral nuclear talks to solve the North Korean nuclear crisis is a prerequisite factor in pursuing economic development in North Korea.

REFERENCES

FAO/WFP. 2001. Oct. 26. "Special Report: FAO/WFP Corp and Food Supply Assessment Mission to the Democratic People's Republic of Korea."

_____. 2002. July 29. "Special Report: FAO/WFP Corp and Food Supply Assessment Mission to the Democratic People's Republic of Korea."

Kim, Woon-Keun, and Kwon Tae-Jin. 1999. "Assessment of Food Supply in North Korea." *Journal of Rural Development* 22(2).

Kim, Young-Hoon. 2001. "The AREP Program and Inter-Korean Agricultural Cooperation." *East Asian Review* 13(4).

Kwon, Tae-Jin. 2003. Jan. 23-25. "Current South Korean Economic Support to the DPRK." paper presented at International Conference on Food and Security in the Pacific: The Impact of China and North Korea, St. Louis, Missouri.

_____. 2003. Jan. 23-25. "Recent Agricultural Policy in the DPRK."

paper presented at International Conference on Food and Security in the Pacific: The Impact of China and North Korea, St. Louis, Missouri.

_____. 1999. "Fertilizer, How Much is Necessary?" *East Asian Review* 11(3).

_____. 2003. "Change in Agricultural Policy and Its Prospect in North Korea." *KDI Review of the North Korean Economy* 6(6).

Lee, Keumsoon. 2001. Sep. 7. "Assisting North Korea by Inter-governmental Agencies and Non-Governmental Organizations: Current State and Implication." paper presented at an International Organizations' Assistance to North Korea and Inter-Korean Cooperation.

Norland, Marcus. 2003. June 5. "Life in North Korea." Testimony on Life Inside North Korea Subcommittee on East Asian and Pacific Affairs. United States Senate, Washington, D.C.

_____. 2003. "Famine and Reform in North Korea." WP 03-5, The Institute for International Economics.