

STRATEGIES FOR NORTH KOREAN FOOD SECURITY RECOVERY AND AGRICULTURAL DEVELOPMENT REHABILITATION PROGRAM

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I. Introduction

North Korean agriculture has stagnated since 1990. Despite tireless relief efforts and current favorable weather conditions that have slightly improved the food situation, the country is still far from eradicating famine and starvation. The primary causes of continuing food shortages may derive from the socialist agricultural policy of North Korea. However, the effects of the collapse of the former Soviet Union and Eastern Bloc, the interruption of aid and trade partnership with China, and the devastation caused by multiple natural disasters are clearly significant.

Agricultural development and national economy have an inseparable relationship. Recent aggravation of the North Korean economic situation has reduced the availability of essential agricultural supplies such as fertilizer, agricultural chemicals and farm machinery by one fifth from the levels of the 1970s and early 1980s. The decline in agricultural supplies is not only caused by the shortages of petroleum and raw materials, but is also adversely affected by the deterioration of aged production plants. Agricultural infrastructures and facilities are also damaged beyond repair and are not recovered from flood damage in 1995 and 1996. The forests are devastated as a result of logging for

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fuel, leaving barren hills and mountains vulnerable to natural disasters.

Due to the current economic situation, agricultural rehabilitation of North Korea by her own effort is not feasible. The agricultural production improvements necessary to alleviate the food crisis require the redesign of agricultural infrastructures, especially the improvement of the irrigation system and reforestation.

One of the alternatives for economic recovery of North Korea is to adopt a Chinese-style Opening and Reform Policy. However, North Korea faces a dilemma. It is hesitant to proceed with such reform policy without a guarantee from the international community of protection against economic and political intervention by South Korea. Therefore, North Korea may prefer to apply this policy through improved relations with neighboring countries such as Japan and China as well as the United States. However, these neighbors are hesitant to extend economic cooperation without South Korean financial involvement. Ultimately, it is imperative for South Korea to undertake a leadership role in the international community towards the economic rehabilitation of North Korea. Admittedly, it will be very difficult to convince North Korea to accept South Korea's helping hand, no matter how sincere or generous, due to deep-seated mistrust between both governments, particularly North Korea's fear of economic dependency on South Korea.

In short, the eradication of the North Korean food shortage will require North and South Korean agricultural cooperation coupled with cooperation and aid from the international community. Recent gestures of reconciliation between North and South have been encouraging. For example, the South Korean government made a sizable donation of fertilizer in 1999, supplementing the ongoing agricultural development aid and cooperation from the international community. Such positive developments suggest that more and more ambitious agricultural development projects may be proposed as cooperative projects between the two Koreas. Cooperative projects should initially focus on the improvement of North Korean agricultural productivity, but cooperation should gradually expand to pursue mutual benefit in other areas of economic development.

By analyzing the current agricultural status of North Korea, this study attempts to propose a cooperative agricultural development program for food security recovery of North Korea through a

consideration of all recoupable factors. The ultimate purpose of this study is to recommend a North Korean Agricultural Development Program to alleviate food shortages and to promote a self-reliant market economy for North Korea that encourages an atmosphere of peace and stability on the Korean Peninsula.

II. Current Status of Agricultural Cooperation between North and South Korea

Recent media attention to the food crisis in North Korea drew a significant amount of food aid from the international community. The annual food aid over the past three years is 600,000 to 700,000 tons, and the current market value of the food aid is approximately \$ 200,000,000. If the amount of money devoted to food aid had been spent on agricultural inputs such as seed, fertilizer, and agricultural chemicals, North Korea could have produced three times the amount of food it received from the international community.

Despite the tireless relief efforts of the international community, North Korea continues to suffer from famine and starvation. The international community is therefore seeking to solve the problem of agricultural production through the supply of agricultural inputs and technology transfers.

During past several years the international community (including South Korea and United Nations organizations such as WFP, FAO, IFAD and UNDP) has been involved in aid and cooperation. WFP has been the driving force in promoting humanitarian emergency food aid amounting to \$ 385,300,000 from September 1995 to March 1999. Currently, WFP in cooperation with UNDP and FAO is working to transform simple food aid to a Food for Work Program. South Korea alone has donated \$ 32,200,000 worth of food or 8.7% of the total WFP contribution to North Korea. During this period, South Korean food aid to North Korea including the contribution to WFP totaled \$ 353,000,000 including \$ 269,300,000 from the government and \$ 36,000,000 from the South Korean NGO community.

On the other hand, FAO has been pursuing long-term agricultural improvement. It has supported 11 different cooperative programs including pest control and sericulture since 1995 and has supplied \$ 35,000,000 worth of agricultural inputs including vegetable seeds and

fertilizers in 1996. Currently, FAO is conducting 16 projects such as the Spring Barley Double Cropping Project, crop production efficiency improvement, and animal disease diagnostic technique development. They are also in the process of evaluating two new programs: support for vegetable production, and a livestock production improvement program.

IFAD is supporting the Mid to Long Term Agricultural Development Program in North Korea. They have committed to invest \$ 24,250,000 from 1996 to 2002 for sericulture development projects: establishing mulberry farms, building silk worm rearing huts, and silk

TABLE 1 Agricultural Development Project for DPRK Supported by UN Organizations

Organization	Major Project	Project Period	Project Details	Total Cost (in \$ million)
IFAD	Sericulture Development Project	1996-2002	-Establishing mulberry farms -Building silkworm-rearing huts -Improvement of silkworm species	24.25
	Crop & Livestock Rehabilitation	1997-2003	-Materials such as fertilizer & pesticide -Improvement of breeding for small-medium livestock (e.g., goats, chickens) -Building feed plants & hatcheries -Small-scale loans for farm households -Assistance for increasing land utilization	32
FAO	Assistance for Agriculture Census	Jul.1998 Sep.1999	-Collection of data and dissemination -Development of analytical techniques for agri-statistics -Educational training for statistical research techniques (such as sample survey methods) -Construction of database for agricultural statistics	
	Small-scale Double Cropping Project	Apr.1997 Dec.1998	-Double Cropping Project for enhancing land utilization rate(FAO/UNDP) -Major assistance items: seeds, fertilizer, pesticides, technical aid	

worm breeding. They are also in the process of promoting the recovery of grain and livestock production capacity. Recent projects under development include rural infrastructure recovery and capital investment planning.

UNDP, along with FAO and WFP, has been supplying the heavy equipment for flood damage rehabilitation and organizing forums to induce support for agricultural development programs. It is not involved, however, in direct investment or joint cooperative programs with donor countries, or in supporting education and training programs.

Recently, UNDP has begun considering a new approach to North Korean agricultural development programs. It has begun to pursue a long-term solution for the food crisis by increasing the supply of agricultural inputs. In May and November 1998, UNDP and North Korea jointly held a "Thematic Round Table on Agricultural Recovery and Environmental Protection in the Democratic Peoples' Republic of Korea" in Geneva, Switzerland and Rome, Italy, to promote this project. The goal of this project is to eliminate North Korea's dependence on emergency food relief projects and humanitarian aid programs by the year 2002. By 2002, these aid projects are to be replaced with cooperative developmental programs. Therefore, it is necessary to explore new projects to supply \$ 250,000,000 worth of agricultural inputs and raw materials annually for the next five years, in order to achieve the project's goal of 6 million tons of grain production and distribution.

In addition to this agricultural input program, the UNDP plans four other programs:

- (1) the rural rehabilitation program including soil improvement and irrigation system increment,
- (2) conservation and an environmental program such as fertilizer plant recovery,
- (3) rural fuel sources and forestry management, and
- (4) seed multiplication of AREP supported program and training programs. Together, the UNDP's five programs require \$ 344 million.

UN organizations are cooperating with each other to promote agricultural development and food security projects. The most important development projects are the double cropping and crop

diversification program, and an agricultural credit program. The primary food security issues include forestry recovery and potato production improvement.

The following-mentioned programs are already showing problems. Since FAO, IFAD, WFP and UNDP have independent agricultural support and cooperation programs without coordination,

TABLE 2 Agricultural Recovery and Environmental Protection (AREP) Program, 1999-2001: DPR Korea

Project/Program	Cost (in \$ million)
Agricultural Input Program	
- Fertilizer	172.8
- Other inputs	40.2
<i>Sub-total</i>	<i>213.0</i>
Rural Rehabilitation	
- Land reclamation and protection	20.9
- Irrigation improvements	18.0
<i>Sub-total</i>	<i>38.9</i>
Fertilizer Industry	
<i>Sub-total</i>	<i>12.0</i>
Forestry and Environment	
- Support to agriculture on marginal land	1.6
- Fuel wood and timber production, incl. nurseries	49.4
- Natural forest and forest sector management	1.4
<i>Sub-total</i>	<i>52.4</i>
AREP Support and Capacity Building Program	
- Seeds production	9.0
- Mechanization services improvement	10.9
- Bio-pesticides production	1.5
- Agricultural support services	0.5
- Agricultural sector management	5.5
<i>Sub-total</i>	<i>27.4</i>
<i>Grand Total</i>	<i>343.7</i>

there is no continuity and there has been no progress towards the agricultural infrastructure improvement program which South Korea has been planning. The major emergency food aid and agricultural assistance were supported by WFP, FAO, IFAD and UNDP, and North Korea is devoting a sincere effort to increase the support from the UN.

Although large scale agricultural cooperation projects supported by the South Korean government have not yet been agreed upon, small scale support from the South Korean NGO community is in progress, though they are proceeding very cautiously. The main method of cooperation is to supply agricultural inputs from South Korean NGOs for trade with agricultural products from North Korea in the form of contract production. There has also been some effort to obtain mutual benefit through a joint venture farming agreement in the form of business cooperation and to promote agricultural technology transfer

TABLE 3 UN Joint Appeal, 1999

Sector	Project	Assignment Organization	Cost (in \$ million)
Agriculture Improvement	- Double-cropping	FAO/UNDP	20.3
	- Diversification(Spring)	FAO/UNDP	18.9
	- Agri. production & diversification for double-cropping expansion of fall, winter barley		
	- Recovery of food security through rural financing	UNDP	62.3
	- Rehabilitation of sea dike	UNDP	9.9
	- Rehabilitation of seed-raising	UNDP	2.1
	<i>Sub-total</i>		<i>113.5</i>
Food Security	- Emergency food aid	WFP	124.29
	- Assistance of seed & instrument for kindergarten, nursery school	CAD	0.4
	- Improvement of Food Security	CW	0.65
	- Providing lunch for school children of Hungnam city	GAA	3.18
	- Forestry rehabilitation	GAA	0.35
	- Material aid for potato production	GAA	1.0
	<i>Sub-total</i>		<i>129.86</i>

TABLE 4 Situation of Private Cooperation Project between South and North for Agri. and Fisheries Sector

Enterprise	Project Contents	Admission of Business Proprietor (Admission of business)	Degree of Progress
Doore Maetul	Cooperation method; contract farming establishment of joint farm - Joint farm (gathering seeds, Experimental farm of 30 ha) - Contract production (3,000 ha) Assistance of artificial seed potato	Apr.8, 1998 (Jul.27, 1998)	-
International Corn Foundation	Cooperation methods: agri. technical & supply exchange between the South and North - South: Corn seeds, materials, technical Assistance - North: Experiment Cultivation Experimental cultivation of new corn Hybrids - 1,000 ha at 10 regions in the North Exchange of cultivation technique joint research	Jun. 18, 1998 (Simultaneous admission)	Mar. 25, 1999 (Admission to expand business scale)
Baiksan Group	Aide of fertilizers and seeds Cooperation method; establishment of joint company in rajin-sunbong economic trade area - Joint investment of Korea, DPRK, China Through production of mushroom, extension to domestic farm household - Mushroom production and export	Oct. 28, 1998 (Simultaneous admission)	-
Haiju Co.	Cooperation method; establishment of fisheries joint co. - South: assistance of shipping and fishing technique - North: fishing operation and storage Domestic carrying of jointly produced fisheries	Jan. 8, 1999 (Simultaneous admission)	- Carrying of marine production - Consulting with government for business

cooperation through the supply of seed, fertilizer, production technology exchange, and cooperative research to establish a foundation to improve North Korean agricultural production. However, these efforts have encountered a great deal of problems.

In general, agricultural cooperation between North and South Korea lacks clear agreement as to its goals. Neither its progress nor the outcome of the projects is predictable, and the continuity of this relationship is not guaranteed. For example, North Korea does not honor the basic cooperation agreement between North and South Korea, by delaying payments. In addition, expenses for the implementation of cooperation projects are too high. Therefore, most cooperative efforts conducted thus far have been one-sided aid from South Korea rather than mutual cooperation.

Is there an expectation to alleviate the food crisis in North Korea in a few years through this kind of support mechanism? In reviewing the agricultural assistance projects requested by UN organizations, the majority of the requests are mid- to long-term programs and the program details do not reflect the gravity of the current situation. Unfortunately, it appears to list unorganized programs simply to obtain patchwork aid from the international community. This may be caused by the inexperience of North Korean specialists in grant applications. If this is the case, it is recommended they obtain assistance from international organizations or qualified consultants to streamline the project proposals to emphasize a pragmatic, concise and integrated course of action.

III. North Korean Agricultural Development Policy

Since their establishment, North Korean agricultural policies have been directed to solve food shortage problems. They also steadily carried out projects for reformation of the natural environment to acquire additional arable lands. Despite enormous efforts to achieve food security, the rate of growth in agricultural productivity has steadily and rapidly declined in the past decade.

Hence it becomes necessary to identify the weaknesses and the potential priority development issues to solve the prevailing food deficiency problems in North Korea. According to the knowledge gained by the international community, technology transfer and

managerial innovation in farming appear to be the priority matters. Cultivars and cultural practices require improvement. In addition, the prevailing single cropping system, under which only rice is grown in paddies and maize in the upland, must be replaced with other multiple cropping patterns to overcome the unfavorable natural environment. Yield can be increased by adopting a crop rotation system that prevents the soil depletion caused by single cropping.

The important agricultural administrative issues stated by the government are prioritized in land policy and production policies including agricultural infrastructure improvement, increased potato production, expansion of double cropping, seed improvement, organic fertilizer application and land readjustment. This year's agricultural policy declared by the North Korean Government is not necessarily a true reform, but it is a simple improvement for an agricultural production system.

The recent agricultural system improvement policy promoted by North Korea can be divided into two major areas: (1) crop diversification and (2) the transition from chemical fertilizer to organic fertilizer. The previous leadership's policy for the increase of food production promoted maize as the single major upland crop throughout the country. Unfortunately, this development ignored the diverse micro-climatic differences within Korea's mountainous terrain, where many different crops have historically been cultivated. In addition, the Juche farming principle of "the right crop at the right place" was misinterpreted and improperly implemented. These factors inhibited the improvement of grain production. Nevertheless, with new leadership and assistance from the international community, improvement in the system of agricultural production is progressing through the diversification of minor crops, essentially a deviation from the uniform maize priority cropping system.

The expansion of crop diversification in 1999 aims to increase potato production acreage either by double cropping or by replacing unproductive maize fields which followed small grain (especially spring barley and winter wheat) in the double cropping system implemented in 1997 and 1998. The new leadership's emphasis on potato production as an integral part of food security stability policy is a significant policy change. This diversification, however, does not mean that potatoes have been chosen as the major upland crop. Maize

is still the major field crop along with rice. This policy change, however, does reflect the willingness of the new leadership to strengthen the “right crop at the right place” principle and to implement crop diversification through the addition of a third major crop in addition to the already fully implemented small grain double cropping system. Nevertheless, this policy demonstrates the somewhat expanded autonomy of cooperative farms to participate in the selection of which crops to produce.

On the other hand, increased potato production as a part of food security policy is a very meaningful transformation under the present leadership. Diversifying crops away from the maize as a major crop policy of previous leadership under the slogan “Maize, the King of the Upland Field Crops” led “Maize” to become synonymous with “food security.” Although the concept was very good in theory, in reality it was rather difficult to implement this policy throughout the country. North Korea attempted hybrid improvement through plant breeding even in areas where it was not at all suitable.

The new policy to promote the potato as a new major food crop is largely based on the production specificity of potato and the geographical and the climatic conditions of North Korea. Potato, a cool season crop that grows well in highland and alpine areas, is well suited to North Korean climatic conditions where 80% of the land mass is rugged, mountainous terrain. Therefore it is ideal as the second crop of a double cropping system or as the major crop depending on the area. Potato is considered to be the most appropriate crop in Ryanggang, North and South Hamkyong and Jaggang Provinces. In the current economic context, it is additionally advantageous in North Korea because potato requires less fertilizer than maize. Potato is a rescue crop in famine because of its high potential yield capacity under adverse conditions. Currently, the slogan “The king of the upland field crop is Potato” is gaining momentum in North Korea and potato is expected to be the third major crop along with rice and maize.

It is our understanding that North Korea has established four major practices for increased potato production:

- (1) production of high yield elite varieties,
- (2) high quality seed potato dissemination,
- (3) improved cultivation methods, and

(4) soil fertility improvement.

Potato fields are established and promoted by pioneering new arable land and by replacing existing maize fields. In the double-cropping system, potatoes are produced as the first crop and/or as an inter-planting crop.

The government has permitted farms to choose the most appropriate crop for double cropping in their area, depending on the climatic conditions, soil fertility situations, agricultural input supply capabilities, and other production conditions. After the great effort in the past two years and a successful harvest of small grains last year, the expansion of double cropping was again presented as the most important issue in agriculture this year. The increased emphasis on double cropping is largely due to increasing problems resulting from food shortages in the 1990s. Thus the double cropping model is based on a grain-to-grain formula to increase food grain production. In case of grain-to-grain double cropping, it will be ideal to plant winter barley and/or wheat in the first week of October and harvest at the end of May or the first week of June next year to avoid intense labor requirements for the harvesting and planting.

Double cropping involves potato cultivation in areas where it is especially difficult to implement grain-to-grain double cropping, such as Ryanggang, Jaggang, and North and South Hamkyong Provinces. South of Anju, South Pyongan and Hamhong, South Hamkyong Provinces, where double cropping has traditionally been implemented, a potato-rice double cropping system is being encouraged along with rice after spring barley and winter wheat.

North Korea's double cropping expansion appears to be very closely linked to the Double Cropping Program of the UNDP/North Korea joint program, which has been executed since 1996. In the first large scale double cropping implementation of 1997, 38,000 ha of spring barley were planted. In 1998, this was expanded to 70,000 ha of winter wheat, spring wheat and spring barley. This year it has been planned to increase the double cropping area to 100,000 ha and diversify the crop to potato, soybean and vegetables along with barley and wheat.

North Korea has relatively advanced plant breeding techniques, but its seed production system is chronically unable to meet demand and optimal planting times. Hybrid maize and vegetable seeds are in

especially short supply. Although North Korea is said to have developed superior maize hybrids and seed production and distribution are now being limited due to the severe economic crisis. The rice seed supply is somewhat better in the plains but there are shortages of the short season varieties grown in the eastern mountain regions. Therefore, the South Korean Jinboo variety is now being tested in the areas with climate conditions similar to those where it is produced in South Korea.

In addition to crop diversification, another aspect of agricultural reform is the transition from chemical fertilizer to organic fertilizer. North Korea stresses that this transition is essential to avoid further soil acidification caused by the excessive application of chemical fertilizer, but it is also necessary due to shortages of chemical fertilizer.

North Koreans understand that soil fertility improvement is the fundamental prerequisite for high density crop production. North Korea has been emphasizing soil fertility improvement as a prerequisite to maintain the repeated high density cropping under the limited arable land situation since determining that the soil fertility maintenance through crop rotation alone is not possible.

Until the 1980s, North Korea was able to meet its needs for agricultural inputs such as fertilizers, pesticides, farm machinery and other supplies. In the 1990s, however, it lost the ability to supply these inputs. Furthermore, many years of liberal application of chemical nitrogen fertilizer has caused severe soil acidification and water pollution. In order to recover soil fertility, it is necessary to apply organic fertilizer and lime fertilizer, but sufficient amounts are unavailable due to the unfavorable economic situation.

Chemical fertilizer production in North Korea in 1998 was only 47,000 tons. The total supply, from both commercial sources and humanitarian aid, was only 124,000 tons or 16% of the annual requirements as measured on the basis of active ingredients. North Korea is now encouraging an expansion of compost and microbial fertilizer production and application to increase potato production and support double cropping.

At the same time, agricultural chemical production has been limited. North Korea produces about 20 different types of agricultural chemicals and the quantity of chemicals produced per year, by active ingredient, is only 11,000 tons. The country has been importing a

nominal amount of pesticides from Japan and China. Presently, North Korea has practically discontinued pesticides production due to shortages of raw materials and energy.

North Korea achieved farm mechanization very early under the former policy of collective farms and large scale land rearrangement. North Korea began to manufacture farm machinery in the early 1970s. However, the large-scale machinery manufacturing of the past is inefficient for present farming conditions in North Korea. During its third Seven Year Plan (1987-93), North Korea intended to increase the number of tractors to 10 per 100 ha in the plains areas and 12 per 100 ha in mountain regions. However, it achieved an average level of only 6 to 7 tractors per 100 ha (Choe et al. 1995). North Korea now faces a far lower rate of farm machinery utilization, as the country is currently unable to manufacture new farm machinery and faces fuel shortages as well.

The North Korean government has promoted a nationwide land reorganization program. The program began last year with a model program in Kangwon Province involving 30,000 ha. It is to be completed at the end of this year.

A nationwide campaign encourages maximizing the rate of land utilization. Meanwhile, great efforts also have been directed toward increasing the amount of arable land by developing terrace farms and reclaiming tidal land. Terrace farms established on the mountain slopes include terrace paddies, terrace upland, and terrace orchards. At the same time, the country has also promoted projects such as the irrigation of upland, land rearrangement, land improvement, and mountain erosion control.

North Korea has converted over 167,000 ha of slopes below 18° to terrace farms. From the 1970s to the mid-1980s, these farms were fairly successful in producing apples, resource plants for honeybees, mulberry trees for sericulture and food crops. In the process of nationalizing non-arable lands and mountains, approximately 400,000 ha of mountain areas were allocated to the cooperative farms for firewood (mostly bushes) supply. Of this land, 150,000 to 200,000 ha, or 40 to 50% of the allocated area, was reclaimed into mulberry fields, orchards, and food crop terrace farms (Kim 1997, 22).

The expansion of arable land and deforestation caused by lumber and firewood demand have created severe soil erosion problems. This

has resulted in flooding. Reclamation of small parcel terrace farms by unauthorized and unskilled rural residents on the steep slopes of hills and mountains is also becoming a cause of flood. Most of the deforested and devastated mountain areas and the reclaimed terrace farms are located in the highly populated and primarily agricultural regions of the Southwest Plains area. These regions of gently sloping mountains near plains with ample average annual rain fall were most severely damaged by the 1995 and 1996 floods.

Since the middle of the 1980s, there has been rapid decline in utilization of terrace field ensured by the soil depletion, short fertilizer supply, and constraints in machinery use. Since the 1990s the situation has turned much worse in terms of recovering for productive farming. It is known that there are about 317,000 to 367,000 ha of ruined mountain area as well as significant size of terrace farms. Again, it appears to be that the food shortage problem is closely linked to the over excavation and deforestation stemmed from the inappropriate arable land reclamation policy.

The reclamation of tidal land is considered to be the most effective measure for increasing rice production. Tidal land reclamation projects have achieved reclamation of 86,000 ha, or 27% of the estimated potential reclaimable area of 320,000 ha (Ministry of Clnification 1994).

Further implementation of the tidal land reclamation projects is now being restricted, due to the unfavorable financial conditions. Moreover, supplemental infrastructure rehabilitation of farms, water supply facilities, and desalination projects has not yet been completed as scheduled.

Irrigation became a top priority in 1964. Closely linked irrigation networking was vigorously promoted, resulting in the construction of large and small reservoirs and dams, connecting canals between multi-purpose reservoirs and farm land, and water pumping facilities. Since the 1980s, North Korea has constructed canals connecting to reclaimed land on the West Coast. Readjustment of existing irrigation channels and construction of rotating irrigation system between different regions are undertaken as an important national project.

The DPRK operates an irrigation system divided into 12 regional irrigation channels that are oriented to main rivers and dams.

It is constructed in a distinctive irrigation channel system in which 5 rivers, the Amrock, Chongchon, Yesong, Jaeryong, and Daedong are rotationally connected to each other. The heavily developed irrigation canals and reservoirs are, especially concentrated in the western plain regions of North and South Hwanghae Provinces and South Pyongan Province. These irrigation canals have sufficient surface water resources and are the main water channels supplying irrigation water across the large plain of rice cultivating areas. Water pumping and ground water drilling facilities are mainly established in the mid-mountain regions for the purpose of increasing upland crop production. Based on the information obtained, it may be fair to assume that irrigation capacity can be improved to a sufficient level, if the funds and technology are provided to upgrade the existing facilities and to properly manage the system in the near future.

This large-scale irrigation system has some problems because it was not constructed in alliance with natural water flow but was designed to operate by pumping facilities without considering the operational difficulties and energy conservation. Therefore, the majority of these facilities are currently out of operation due to energy shortages, the unavailability of additional investment, deterioration of equipment and facilities, and damage from the severe floods in 1995 and 1996.

Even under recent fair weather conditions, crop production has been suffering from a lack of water. In addition, erosion caused by extensive deforestation has raised river bottoms so high that many farms were washed away, buried, or destroyed. Approximately 40,000 ha of arable lands are thus left idle.

Furthermore, about 60,000 heads of livestock have been lost due to recent feed shortages and shortages of forage crop fields and pastures. The quantity of feed fell to half the pre-flood level. Supply of livestock has been practically discontinued since 1992 (Kim 1997, 108-113).

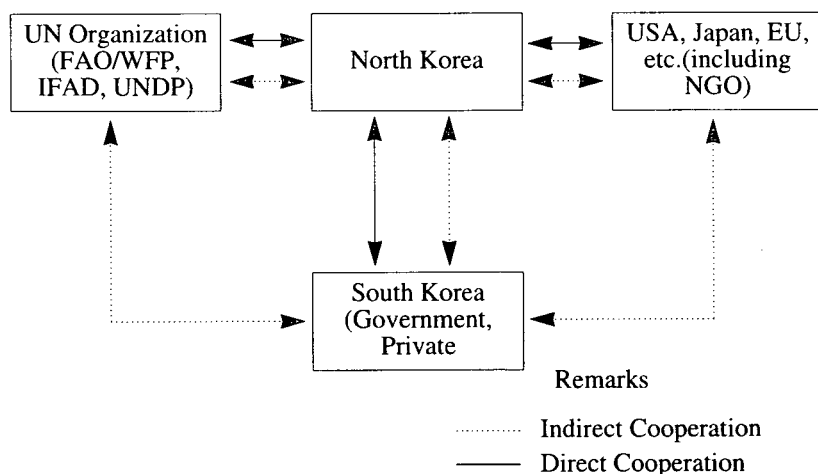
Animal husbandry in North Korea is regressing to a primitive state. It is necessary to raise grass-eating animals or low-feed consuming animals such as goats and ducks to avoid feed competition with human food. Beef is only available from retired draft animals, and swine and chicken, formerly the major livestock products, are no longer available to general population today.

IV. Strategies for North Korean Agricultural Development Projects

The objectives of North Korean agricultural development assistance projects are to avert famine and starvation and to assist the country in implementing an economic reform and open-door policy, eventually transforming into a market economy. In the past several years, humanitarian emergency food aid has been the primary form of economic cooperation with North Korea. However, agricultural development programs are a more efficient method of resolving the food security crisis. The international community has tried to find alternative economic cooperation measures, including agricultural development projects, to move the country toward self-reliance.

North Korean agricultural development programs require a mid to long term approach. The potential cooperative agricultural development programs with North Korea are direct cooperation between the South and North Korea, collaboration between the international community including the UN and North Korea, and collaboration among South Korea, the international community and North Korea.

FIGURE 1 Agricultural Development Cooperation with North Korea



One of the possible indirect cooperation methods is cooperation between the UN and North Korea under the support of South Korea. The South can also organize a consortium with the U.S., the EU, and Japan for North Korean agricultural development project. Major advantages of direct cooperation between South and North Korea are to increase efficiency, save time and costs, and take advantages of experiences to enhance the working relationships. This method can provide understanding between North and South Korea to accelerate transformation of North Korea into a market economy and will minimize the unification costs.

Support to the North from international organizations is a part of UN programs to support the economically developing countries. This kind of program is highly successful because international organizations can utilize experiences obtained from various supporting projects for different countries. Limitations of this kind of projects lie in project scale. That is, this type of project has been more effective for small scale projects than for large scale and overall projects. In spite of the limitation of small scale projects, the influence of a successful project will provide a significant impact on North Korean agriculture as a whole. Agricultural cooperation with North Korea must be performed in an orderly manner regardless of the scale of projects to capture efficiency and make projects succeed.

Priorities of projects for North Korean agricultural development cooperation should be the projects that can avert food security problems to encourage North Korea to accelerate reform and to transfer itself into a market economy. Projects that can provide opportunities for South Korea and the international community to work with North Korean specialists are also desirable.

The most pressing priority in agriculture is providing necessary inputs such as seed, fertilizer, pesticides and fuel for machinery to existing cooperative farms. Contract farming is one method of obtaining agricultural inputs in the short run. Under a contract farming arrangement, South Korean parties provide agricultural inputs, and farming is conducted by North Korea according to requests from and under the supervision of the South Korean parties. The output is shared between the parties based on the contracts. Another project is the "Hap-young Nong-jang," or "Joint Cooperative Farm," which is jointly managed by two parties. Another approach is

to provide agricultural technology to North Korea for double cropping in order to improve the land utilization rate. The other important projects are as follows: a farm credit policy for individual farmers, establishing farmer's markets or agricultural markets, education and training for farmers, and food-for-work projects.

The desirable mid term projects are agricultural input production industry development including seed and feed production, fertilizer and pesticides industry, technology development, crop diversification, double cropping, livestock industry rehabilitation, sericulture and farm machinery improvements. It is extremely important to establish a seed improvement program including a seed multiplication program and seed production system with seed conditioning plants along with fertilizer production plants to increase unit area productivity.

Strategies of cooperation projects with the North should be based on the experiences gained by UN organizations meeting the North Korea's need or expectation, and consideration of ongoing projects. Large scale rather than small scale projects are desirable, based on the experiences of projects performed by consortium of the South with U.S., EU, China and Japan. The consortium projects should be carried out dividing duties among participants, UN organizations and individual countries according to their comparative interests. For example, consortium projects in the same region can be performed by dividing specialties, i.e. IFAD for agricultural development, FAO for technology development, UNDP for education and training, WFP for food-for-work project, etc.

Long term, large-scale projects recommended include: reforestation, terrace plot restoration on slopes of mountains, reclaimed land reorganization, farm land readjustment, readjustment of orchards and mulberry land, land development, irrigation system development, farm house readjustment, and infrastructure development such as running water and drainage system development. "North Korea Agricultural Development Fund (NKADF)" or "Korean Peninsula Agricultural Development Organization (KADO)" needs to be organized in the form of an international consortium and this organization or fund can be extended to coherent long term plans of cooperative projects to assimilate various works under a Secretariat.

If the North Korean Agricultural Development Program is operated by South and North Korea, excluding other international participants, the cooperation will be economically advantageous, but this idea will be very hard to sell to North Korea.

V. Conclusions

International organizations' humanitarian food aid must be transformed into agricultural development projects. The objective of the North Korean Agricultural Development Project is to relieve the food shortage of North Korea along with encouraging rehabilitation and the opening of North Korea and eventually to ease into a market economy system. Because the food shortage of North Korea is due in part to the institutional problems of the collective farm system, the way in which North Korea can solve this problem by itself is the adoption of an individual farm production system that diversifies into a market system. South Korea, along with the international community, should assist North Korea in the recovery of food security by continuing the emergency food supply for the time being as a short-term project. Meanwhile, the consortium should simultaneously prepare North Korea for self-sufficiency in food production through large-scale agricultural conglomerate development projects for the mid- and long-term.

In the past four years, we have learned that independent small-scale and temporary agricultural cooperation projects with North Korea, such as those conducted by the UN organizations and other members of the international community, cannot eradicate the food shortage problems in North Korea. Thus, it is essential that the international community, including South Korea, work with North Korea to draw up a master plan for pragmatic, large-scale programs that will coordinate the individual projects.

Although many believe that the South Korean government can directly participate in the agricultural development projects in North Korea, this may be overly optimistic considering the current relationship between the South and the North. For the time being, non-governmental agricultural cooperation should continue. The government should attempt to involve itself with the projects only after building mutual trust further through an expanded collaboration

with the assistance of UN organizations and the international community. Enhanced cooperation between the South Korean government and UN organizations can speed up both direct and indirect contacts with North Korea.

South Korea may participate in the projects by increasing its trust fund investment in FAO, promoting trust fund projects with IFAD, supporting WFP's emergency food aid, and involvement with the agricultural recovery and development projects of UNDP or the NGO community. After successfully participating in such programs, the South Korean government can negotiate involvement in large-scale projects directly or with the appropriate partners.

If a large-scale project is to be successfully executed, it should proceed in the same manner as the Yongsan River Large-scale Agricultural Conglomerate Development Project of South Korea. The most suitable area for a new large-scale agricultural conglomerate development project is the Chongchon River area located in Pyongan Province. The upper stream of the Chongchon River is chronically damaged by flood and drought. Some desirable large-scale projects are:

- 1) the construction of a flood control system and irrigation channels to provide irrigation water and related facilities;
- 2) a seed multiplication and seed production program including seed conditioning plants;
- 3) recovery of the ruined forest;
- 4) the maintenance of terraced fields and reclaimed lands;
- 5) recovery of agricultural lands;
- 6) the improvement of agricultural land support facilities;
- 7) the maintenance of orchards and mulberry farms;
- 8) livestock farm recovery projects; and
- 9) the improvement of agricultural infrastructure such as improvement of rural communities.

For such a project, the consortium in the form of so-called "North Korean Agricultural Development Fund" or "Korean Peninsula Agricultural Development Organization (KADO)" should be organized to manage the overall operation of the North Korean agricultural conglomerate development project. If these projects are conducted successfully, "The South and North Cooperation Organization" can be established for direct cooperation projects

between the South and North to solve North Korean agricultural problems and even to establish unified agricultural programs in the near future.

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