

North Korean Agriculture: Recent Changes and Prospects after Unification

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Abstract

Modern farming in Korea has followed two divergent paths since the partition of the peninsula. Both countries substantially raised agricultural production in the 1970s, but policy decisions in North Korea created a situation in which the farm sector stagnated and ultimately failed when faced with changes in the 1990s. In addition to reviewing the technical and policy changes since the start of the food crisis, this paper examines the likely consequences of reunification on the North Korean farm sector. Structural changes would include the dominance of a market economy, dissolution of cooperative and state farms, and the need to re-capitalize the entire farm economy. Organizational changes regarding land tenure, operation and management of formerly collective resources, and new roles for former North Korean agricultural guidance and research organizations would be challenging. Rural residents would face personal challenges of adapting to the requirements and thinking patterns of a market economy, coupled with the loss of close technical direction by the North Korean planning system. Although there are opportunities for enhanced farm productivity and economic well being at the household level, smoothly adapting to reunification would greatly depend on planning, policies and resources set in place for such an event.

Key words: North Korea, South Korea, agriculture policy, farm production, famine, unification.

Introduction

Restoring food production and food security in the Democratic People's Republic of Korea (DPRK) has been one of the three central issues occupying North Korean discourse since the mid 1990s, the other two being human rights and nuclear weapons development. Although the issues are not unrelated, this paper will address the causes of the North Korean food crisis, the significant technical and policy changes that have been implemented since 1998 to improve food security, and the probable

changes that would take place in the North Korean agriculture sector following unification. There are interesting parallels between the development of North and South Korean agricultural policies and of their respective agricultural sectors. These have important implications for the shape of North Korean farming were unification to take place.

North Korea has more agricultural potential than is commonly recognized. However, policy choices since the end of World War II created an economic and environmental situation where the country was vulnerable to changes in the external political environment. This precipitated a multi-year famine that was relieved only by substantial international humanitarian and technical assistance. The last two decades have seen improvements in agricultural practice, as well as policy modifications that were promulgated in an effort to stimulate greater farm production. Domestic food production has improved, but is still below the minimum requirement for basic health. This is a problem because North Korea, as a matter of policy, chooses not to import the food needed to meet the nutritional requirements of the population.

The South Korean agriculture sector faces many of the same environmental constraints as the North. Agriculture policy initially extracted surplus from the rural areas to help finance export-led industrialization. This policy was later modified to support the rural sector, and particularly to insure self-sufficiency in rice production through market and price control mechanisms. South Korean farms are productive, but now contribute only about 5 percent of total GDP. The South Korean food supply is now highly dependent on imports financed by dynamic industrial and service sectors.

North Korea has the potential to feed itself, though this choice would not be economically optimal if it were a full participant in the global economy. Should the two Koreas unite under a market economy, the effects on the North Korean rural population would be substantial and very disruptive at the outset. Nonetheless, unification will be positive in the long term, both in terms of raising overall rural productivity and the personal standard of living.

Establishing Modern Farming on the Korean Peninsula

Agriculture after Partition

Following partition at the end of World War II, and accelerating after the Korean War, both North and South Korea instituted structural and

technical changes in their agriculture sectors in an effort to stabilize the rural economy, provide a basis for industrialization, and produce enough food domestically to feed the population. Under Japanese occupation, the northern half of the peninsula was developed as an industrial resource for Japan; the southern half was used as the rice bowl, also to feed Japan. Following liberation, both the North and South Korean governments instituted land reform. The Pyongyang government created a system of cooperative farms (CFs) that were more or less organized about existing rural villages and hamlets, while the southern reform was based on a 3 ha per household limit,¹ creating a relatively homogeneous class of small farmers.²

The northern system utilized centralized direction of cropping patterns and farming methods, production quotas for each cooperative farm, distribution of farming supplies from the central government, and the required contribution of a share of each farm's production to the government Public Distribution System (PDS). Collected goods were distributed nationwide as food rations to the non-farm population. The government established a separate set of State Farms (SFs) for specialized purposes, organizing these entities more like industrial enterprises. Like the rest of the North Korean economy, the agriculture sector was essentially not monetized. The collective performance of the entire cooperative farm was the basis for the calculation and distribution of the annual surplus, and the motivation of workers was largely a function of their commitment to community and national well being.

Beginning under Park Chung Hee, South Korean economic policy emphasized export-led industrial development. This kept food prices low for the benefit of the urban population. Government-guided investment toward industry and urbanization led to rapid growth in manufacturing, urbanization of the population (from 28 percent in 1960 to 55 percent in 1979),³ and the conversion of significant amounts of farmland into factory sites and housing areas. Although domestic food production still met about 80 percent of demand, the rural sector economically fell behind the cities.

Implementing Modern Farming

By the early 1960s, North Korea embarked on a program of the four "rural technical revolutions,"⁴ which were largely modeled on the so-called Green Revolution that was in process around the world. This technology emphasized the development of new hybrid grain varieties

(especially maize, wheat and rice) that were highly responsive to fertilizer application, along with a sharp increase in use of chemical fertilizers. North Korea also rapidly increased farm mechanization, provided electricity to rural areas, and developed irrigation systems to counter highly seasonal rainfall patterns and enable rice production in fields at higher elevations. Because of the perceived need to increase the availability of food staples, grain production (primarily rice and maize) was strongly emphasized, with little production of fruits or legume crops such as soy or mung bean.

In contrast, the agriculture sector in South Korea was lagging behind industry by the late 1960s. In 1972, the Park government began policies to support farmers, raising food prices and initiating the *Saemaul* Movement. Under the *Saemaul* Movement, rural access roads were improved, electricity service was extended, and numerous irrigation systems were constructed or improved. The government expanded agricultural extension efforts, introducing new hybrid rice varieties, and encouraging more fertilizer and pesticide use to increase production. Farm mechanization also improved, with the development and production of small tractors, rice transplanting machines and small harvesting equipment suited to the small size of South Korean farms.

In most countries the Green Revolution resulted in substantial increases in overall farm production, but in many cases also aggravated income and social inequality and landlessness as smaller farmers were less able to procure credit to buy the fertilizer and seed needed to fully take advantage of these changes. This was not an issue in either Korea. In North Korea, improved seed, fertilizer, tractors and other farm equipment, electricity and irrigation water were distributed to all CFs on a relatively even basis at little or no cost to the farmer. In South Korea, the homogeneous farm size gave no advantage to a sub group of large farmers.

North Korean farm production grew substantially and appeared to be a success story in the 1960s and 1970s, paralleling a similar growth of industry. However, the seeds of collapse were planted precisely by the policies that contributed to agricultural growth. Operating in a centrally planned economy and lacking the price signals of a market economy, neither cooperative farm managers nor the central government had any motivation to increase production efficiency. Rice was planted in areas that could not be irrigated without great expense, fertilizer was applied at rates far beyond the economic break-even point,⁵ and machinery designs

were never modernized over the years.⁶ By the late 1980s, North Korea claimed rice yields in excess of seven metric tons per hectare. Although the nation was purportedly self sufficient in food production, there were reports of shortages from one year to another.⁷ This level of farm production, and a parallel growth in industrial production, was substantially financed by advantageous and largely unacknowledged trade relationships with China and the USSR for fuel and essential materials.

In South Korea, individual farm management decisions were guided by economic considerations, though the government had a heavy hand in controlling the price of rice and some other commodities. The Saemaul Movement emphasized empowering local communities and community leaders to take charge of their own development and community growth.⁸ Production and productivity both increased in the 1970s. Farm household income more than tripled between 1970 and 1975, while urban income just more than doubled during the same period. Rice production grew from 3.9 million metric tons (mMt) in 1965 to 4.7 mMt in 1970 and 5.6 mMt in 1985.⁹ South Korea met at least 93 percent of its domestic demand for rice in every year but two since 1973.¹⁰ Farm sizes have remained small and land ownership egalitarian. South Korean farmers have greatly diversified the crops grown in order to satisfy a growing domestic demand for variety and quality of food. Grains other than rice were neglected in favor of vegetable, fruit and livestock production, with corresponding benefit to farm income.

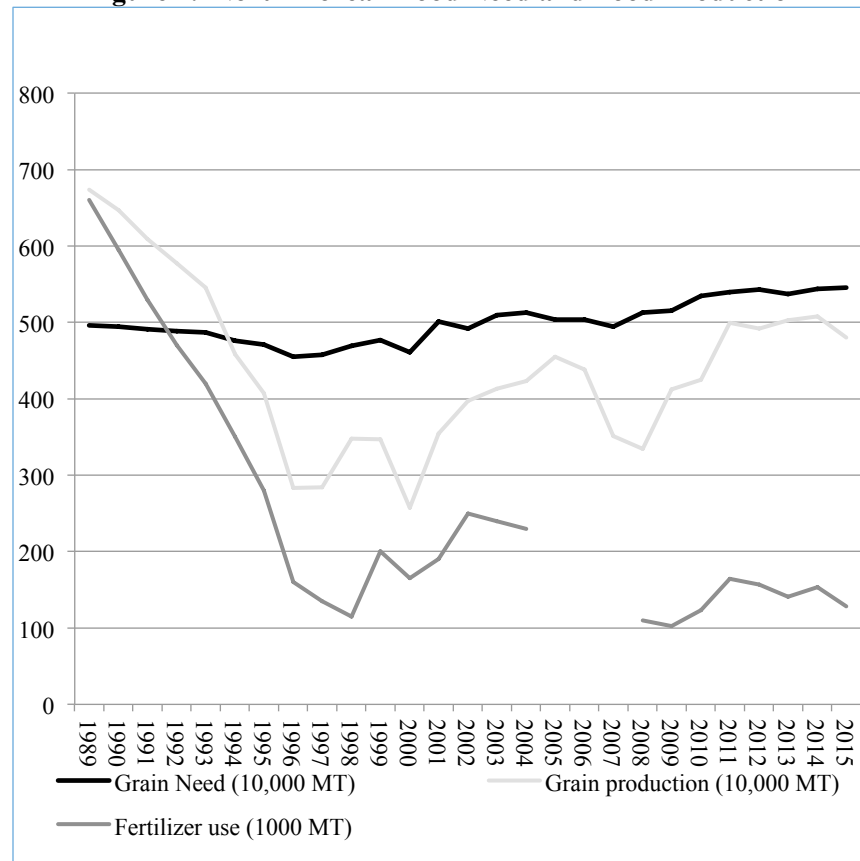
The North Korean Collapse

When the USSR dissolved in 1989 and China at the same time instituted more market based economic policies, their support to the North Korean economy rapidly dissipated. In the agriculture sector, these changes were quickly apparent in reductions in both the availability of fuel for running farm machinery, and in the amount of fertilizer distributed by the government.¹¹ Food production began to decline, PDS rations were cut below the established standard, and the government began to institute campaigns such as “Let’s eat two meals a day”.¹² Lacking adequate fertilizer, rice and corn yields plummeted to about a third of the previous harvest. Years of over-fertilization had also depleted the soil of organic matter, rendering farm production even more sensitive to the loss of nutrients. Deprived of fuel and raw materials, the industrial sector also began to collapse, and farms could not obtain repair parts for

their equipment. With 65% of population living in urban areas, there was no pool of agricultural workers available to pick up the slack for plowing fields, planting and harvesting.

A few years after this contraction began, North Korean farms were hit by three successive years of adverse weather: severe rain and consequent flooding in 1994 and 1995, followed by a prolonged period of drought in 1996. Figure 1 shows the rapid decline in food production between 1989 and 1997, paralleling the drop in fertilizer availability.

Figure 1. North Korean Food Need and Food Production



Sources: FAO/WFP *CFSAR* series 2001, 2003-2013; FAO country summary 2007; FAO Global Indicator Early Warning System 2014, 2015

Farms and farm workers responded to these circumstances as best they could, planting maize on marginal hillsides and increasing the area under double cropping¹³. The government mobilized urban and suburban residents to assist with farm work during the periods of intensive labor demand at planting and harvest. Farmers were also directed to make compost, collecting leaves and other vegetable matter from surrounding areas and carrying it miles to the fields. Farm households put more efforts into their home garden plots (100 m² per household) to buttress their food security. With farm production collapsing, the state could not enforce historical quotas on delivery of a portion of the farm's grain production. Regardless, the government still took a substantial share. Although the Korean famine was most strongly felt in urban areas, farm households were universally short of food during this period.

Technical Changes since 1998

Responding to the humanitarian crisis, foreign governments began in 1995 to contribute food aid to North Korea. At its peak in 2001, donors delivered nearly one and a half million metric tons of food.¹⁴ Some agencies began assistance programs to the agriculture sector, initially providing critical inputs such as seed and fertilizer. As a more complete understanding of the causes of the famine developed among aid workers, efforts were directed to encouraging changes in farming practices, as well as importing some farm equipment. Aid agencies began programs to address the main constraints to production, addressing underlying issues of soil fertility improvement and maintenance, crop diversification, resource conservation and sustainable farming practices. Some international organizations implemented specialized projects centered on such issues as freshwater fish production, animal husbandry, potato seed production and farm equipment repair and maintenance.

Fundamentally, North Korean farmers do not need radical innovations, but rather the opportunity to implement best farming practices that are common throughout the world. Under the central planning system, each region had a limited number of varieties of the major cereal crops from which to choose, and farmers were instructed to follow a one-size-fits-all approach to farming tasks. The farming system thus had little diversity and therefore little flexibility and resilience to changing conditions. Farmers relied on detailed directions from central authorities regarding farming practices, rather than experimenting and changing their crops and farming methods as external factors (especially

weather and the economy) changed. This history, which is now undergoing change, will have an important effect on the ability of North Korean farmers to adapt to the consequences of unification, should it occur.

The effects of foreign assistance on farming in North Korea have been mixed. Technical recommendations helped to increase productivity in many cases, but internal structural or policy constraints made it difficult for farms to implement them on a wide scale. Double cropping depended on foreign donations of fertilizer, and efforts to introduce green manure crops were stymied by a rigid farming schedule. Nonetheless, soybean production has increased substantially.

The government also developed new technical approaches, some appropriate and some less so. Rice and maize breeders in the Academy of Agricultural Sciences began a long-term program to develop new varieties that were more suited to farming in a low-resource environment. Farmers were instructed to raise grass fed animals rather than livestock that require feed grains for large-scale production. Beginning in 1999, the government decreed that farms should radically expand potato production. After an initial spurt of government-mandated enthusiasm—when potatoes were planted in many unsuitable locations—potato farming is now appropriately concentrated on higher elevation lands as a main season crop to replace maize. The government has also encouraged the development of semi organic farming methods that require less chemical fertilizer and more compost and manure in the fields. Figure 1, which shows the collapse of food production in parallel with the loss of fertilizer prior to 1997, also shows the recent recovery of food production despite no substantial increase in the availability of chemical fertilizer. It is difficult to identify all the changes that contribute to this trend, but greater and more effective use of organic sources of plant nutrients likely play some role.

Of more long-term significance, particularly when considering the potential impact of unification, are recent adaptations to the changed economic situation. Lacking adequate equipment, farms have mobilized labor to accomplish necessary tasks and adopted resource conservation strategies. Wherever possible, farmers are rotating crops and using an intensive relay planting of crops. Livestock production at CFs has been decentralized to households, rather than left to a specialized work team. As farm production has recovered, farm households are marketing more of their surplus to the farmers' markets or through other informal means,

rather than delivering it to the government. The changes in policy and practice that underlie increased market participation will be considered in detail below.

Policy and Economic Changes since 1998

While North Korean policy is often viewed as rigid and inflexible, we can identify a number of important changes in policy related to the agriculture sector, some involuntary and some intentional. As the economic collapse of the 1990s grew, people began to ignore regulations in an effort to survive. There have been a number of detailed accounts of these coping strategies, and it is not necessary to review them in detail here.¹⁵ The important trends are reduced government control over population movement, a rise in the general use of markets, an increased proportion of food being sold through the markets (and in some cases diverted in advance of the PDS quota delivery), increased effort on household private garden production both for personal use and sale, and an increase in small scale service and manufacturing activities (food products, furniture, carrying goods on small carts, etc.). Lacking alternatives the state has tacitly allowed these activities.

The North Korean government has also instituted a number of policy shifts over the years, generally with the intention of stimulating increased production both in the agriculture and industrial sector. These policy change points are summarized in Table 1. During most of the 1990s, cooperative farms received a set price for the grain they were required to deliver to the government.¹⁶ The first economic policy shift after the famine occurred in July 2002. At that time, the official exchange rate for the US dollar was 2.12 KPW and the black market rate was around 150 KPW. Food prices in the then-quasi-legal farmers' markets reflected Chinese prices when denominated using the black market exchange rate. The so-called "7.1 policies" effectively devalued the North Korean Won to the black market value, raised prices the farms were to receive for grain¹⁷ and raised workers' salaries more or less commensurate with the devalued KPW. Importantly, these measures also legitimated the farmers' markets. Government apparently expected that that the increased prices would encourage farmers to work harder and produce more, and that increased salaries would encourage more work and support more consumption by industrial and service workers. But lacking additional supplies or fuel beyond the meager government allotments, farms could not significantly increase production. With no increase in

food supply, the gap between official and market prices and exchange rates immediately reestablished itself, and continued to grow. By late 2004 rice and maize sold in the market for 650 and 270 KPW/kg.¹⁸

Table 1. Significant Economic Policy Changes Affecting Agriculture

Date	Policy
July 2002	"7.1 measures". Devalue KPW from 2.12 to 150 per US\$. Set new prices for farm products and food in PDS. Set new salaries for non-farm workers
2004	SWT size reduced in a few counties; farm quotas disaggregated to SWT level.
2005	Prior changes in SWT size and organization quietly erased. Reaffirmation that all grain sales must be to the government, not in the market
2007	Men prohibited from trading in markets; later that year women under 40 years old prohibited; later extended to women under 50 years old.
June 2009	Pyongsong market in Pyongyang closed and split into smaller markets
Nov 2009	Currency redenomination
June 2012	"6.28 measures". Reduce SWT size, disaggregate quota to SWT level and SWT keeps 30% of quota plus excess; private investment OK by certain organizations. Initially implemented in select counties
Feb 2014	Convention of SWT leaders receive letter from Kim Jong Un amplifying details of 6.28 measures
May 2014	"5.30 measures". Further reduce SWT size, change farmer share to 60% of quota and may be sold. Stability of land "tenure" for SWTs.

A second attempt to improve the policy environment occurred late in the 2004 growing season. The government announced that sub work teams (SWTs) should be reduced in size, that farm production quotas would be disaggregated to the SWT level, and that any surplus production above the quota could be sold in the farmers' markets. Cooperative farm leaders that I spoke with at that time were guardedly enthusiastic, though the changes were announced too late in the year to affect any farm management decisions. Apparently these changes were only announced in a few counties, and in any case in mid 2005 they were rescinded.¹⁹

Over the next several years, the government regulated the expanding markets, but continued efforts to limit participation.²⁰ In mid 2009 the Pyongsong market in Pyongyang was closed and split into two smaller markets.²¹ In November 2009, an ill-conceived currency devaluation created momentary chaos in the markets and substantial popular disaffection.²² The KPW was devalued by a factor of 100, and limits were placed on how much currency people were allowed to convert to the new won, thus wiping out the won-denominated savings of many merchants and operators of small private enterprises. As in 2002, the policy was apparently an ineffective effort to rationalize the value of the won and stabilize prices.

In the agriculture sector, policy remained more or less constant until late June 2012 when the so-called “6.28 measures” were promulgated. Initially introduced on a limited and uneven fashion, they have apparently now, for the most part, been implemented nationwide.²³ Key provisions were that SWTs should be kept small (10-12 persons), would be responsible for their own production decisions, and would keep 30 percent of their production quota plus any excess over the quota. Whether the retained grain surplus could be sold in the open market or must be sold to the state was not entirely clear. The timing of these measures and their gradual roll-out made it impractical for farms to implement the changes until the following year (2013) or later.²⁴

In February 2014, over 8,000 SWT leaders were brought to Pyongyang for a convention, and received a detailed letter from Kim Jong-un calling for specific technical and organizational innovations in farming. The letter effectively reiterated the 6.28 policies in an extremely public setting, and both the convention and the contents of the letter were widely publicized within North Korea. Kim Jong-un also confirmed that the distribution of the harvest should be according to the work and productivity of the SWT members.²⁵ It now seems clear that the 6.28 measures were widely if not universally or evenly implemented during 2014.

These policies are apparently having desired results, because a new set of pronouncements (the “5.30 measures”) were issued by the Cabinet and the Central Committee of the Korean Workers’ Party in May 2014, amplifying and extending important elements of the 6.28 policy. SWTs were further reduced to “family size,” teams can now expect to cultivate the same field(s) for many years (this was hinted at in Kim Jong-un’s letter to the SWT leaders), and the farmers’ share of production was

raised from 30 to 60 percent of their quota. These changes are still in process, but appear to continue the movement toward local autonomy in production decisions.²⁶ As with the 6.28 measures, these policies also encourage more rational economic practices for manufacturing enterprises outside the agricultural sector. International program representatives confirm the predominance of the market in all areas of food distribution, including grains, and the apparent changes in farm work team organization.²⁷ It seems that at this moment the momentum is toward greater decentralization in farm management, greater ability to participate in the market, and highly limited but improving ability to access productive resources (farming supplies) through other than government channels. There is no certainty that the government will not reverse these trends in the future, however.

Comparing the South Korean and North Korean Agriculture Sectors

Notwithstanding some commonalities in resource mix and environmental factors, the agriculture sectors in the two Koreas have developed in strikingly different ways. Both countries chose to remove the landowning class through land reform, and to support modern farming methods to insure domestic self-sufficient food production and rural well-being. But the institutional contexts are diametrically opposed, which has resulted in the near collapse of North Korean agriculture. In contrast, farms in South Korea are profitable and productive, even as they contribute an increasingly small share to the overall national GDP.

Statistical Comparisons

The difference in performance of the northern and southern farm sectors will affect unification. Table 2 summarizes some of the differences between the agriculture sectors in the DPRK and ROK. The DPRK has about 35 percent more arable land than the ROK, but only half the population. The North Korean rural population is nearly 10 million, or 39 percent of the national total, compared with 8.4 million in South Korea, 17 percent of the total. While most of the northern rural population is active in farming, less than half of southern rural households farm. The farm labor force is almost three million in North Korea, but just over one million in the ROK. As in other developed countries, however, the workforce in the South Korean food industry, including processing and distribution, is greater than the number directly

farming. The rural population in the south is aging: 39 percent are 60 years or older, compared with 14 percent in the north.

Table 2. Comparison of DPRK and ROK Farm Statistics

Measure (2012 data unless noted)	Units	DPRK	ROK
Total land area	10 ⁶ ha	12.04	10.12
Arable land area	10 ⁶ ha	2.35	1.73
Population	10 ⁶	25.03	50.2
Rural population	10 ⁶	9.89	8.4
% Rural population	%	39.4	17
Rural population age 60 or over	%	14	39
Labor force – 2011	10 ⁶	14.07	25.4
Farm labor force – 2011	10 ⁶	2.94	1.02
Farm labor as percent of total – 2011	%	21%	4%
Arable land per ag worker	Ha	0.86	1.51
Fertilizer use (nutrient)	kg/ha	~65	~400
Area planted to rice - 1970	10 ³ ha	n/a	1203
Rice production, paddy – 1970	10 ³ MT	n/a	6060
Rice yield – 1970	MT/ha	n/a	5.03
Area planted to rice - 2005	10 ³ ha	583	980
Rice production, paddy - 2005	10 ³ MT	2582	7337
Rice yield – 2005	MT/ha	4.43	7.48
Value of crop production per land in use	\$/ha	~1140	~3200

Sources: 2008 Census of Population of the DPRK; U.S. Department of Agriculture Economic Research Service; Food and Agricultural Organization of the United Nations; Organization for Economic Cooperation and Development; *Evaluation of Agricultural Policy*; Index Mundi, *Korea-Rural Population*

Productivity differences are great. Rice yields in South Korea average over 7 MT/ha (paddy), while North Korean yields have only recently recovered to above 4 MT/ha, with 2013 yields estimated at 5.3 MT/ha. Because South Korean farms are more diversified, the value of production per hectare is nearly three times that of North Korea.

Reliable data on North Korean GDP are unavailable, but two estimates place total GDP at \$10.6 billion in 2000²⁸ and around \$21 billion in 2013.²⁹ Agriculture accounts for approximately 21 percent of GDP in the north.³⁰ In contrast, the South Korean GDP was \$1014 billion in 2010, nearly doubled since 2000, and agriculture contributed just

\$42.6 billion or four percent to that total. This does not consider value added by processing.³¹ The South Korean economy is nearly 50 times larger than the North Korean economy.

Agriculture in Context

In both countries, agriculture cannot be understood separately from industry. Both industrial sectors supplied equipment and supplies to their respective farm sectors. In particular, the South Korean agricultural sector was exploited as a source of inexpensive food for a growing urban industrial population. As North Korean industry collapsed following the loss of imported energy in the 1990s, the agriculture sector failed along with it. In the last decade, North Korean farm production has increased. These increases have come without access to industrial goods and equipment, but through reorganizing farm work and applying labor and local natural resources to the greatest extent possible.

Operating in a market economy, South Korean farmers adapted to changing economic conditions and policies, taking advantage of the subsidized domestic price for rice, but also diversifying into higher value crops or livestock production. South Korean farmers also were regularly able to upgrade equipment that was supplied by an evolving industrial sector.

The structural differences between the two economies have resulted in one farm sector which has been unable to maintain or improve its productive capital and infrastructure, and now relies on barely functioning and inefficient equipment, and one farm sector which is well supplied with productive capital, has good access to market infrastructure, and is able to make management decisions based on cost-benefit calculations rather than on the absolute scarcity of crucial supplies. Central control over cooperative farms in the North appears to be both relaxing and failing, especially as the market continues to supplant the state distribution system for foodstuffs and consumer goods. Lack of a convertible currency and regularized trade networks with neighboring countries will continue to impede North Korean farmers' efforts to re-capitalize their equipment and infrastructure, and to invest any surplus or profit they may produce.³²

South Korean farmers face different challenges. As a party to the General Agreement on Tariffs and Trade (GATT) and the Uruguay Round Agreement on Agriculture (URAA), Seoul will reduce barriers to agricultural trade, which will affect farm profitability and farm

management decisions. The government has committed significant funds to restructure agriculture from its emphasis on rice to cash crops, processing and rural infrastructure. The government is expanding rice imports, and reducing price supports for domestic rice production. Nonetheless, substantial support to farmers continues.³³

Considering the Consequences of Unification

Should the two Koreas reunify in the future, the economic and social consequences will be significant for both sides. Planning for possible unification continues, though it seems largely oriented to the development of institutional frameworks that would facilitate gradual unification, as well as building support among the South Korean population for the effort and expense that will be required should unification occur. Although the *2014 White Paper on Korean Unification* outlines ways to build and expand dialogue between the two Koreas, a discussion of policies that might be needed to manage a unified Korea is limited to the last section.³⁴ English language sources regarding detailed planning for activities after unification seem unavailable. Regardless, we are concerned here more with changes to the North Korean agriculture sector, as experienced by those currently part of it. Predicting such outcomes is uncertain, but by understanding the nature of the two systems, some likely directions can be anticipated.

Analytically, we can consider effects at three levels: structural, organizational, and personal. Whatever the mechanism and nature of reunification, I assume the South Korean system will dominate the economy, and central planning in North Korea will completely disappear. Consequently, state enterprises and cooperative farms will in some way be converted into privately managed entities. The initial challenges and changes for North Korean citizens will be substantially greater than challenges for those in the south. For that reason, the discussion that follows focuses on the possible effects of change for the north.

Structural Changes

As I have argued elsewhere, it is both technically and economically possible for North Korea to be self-sufficient in food production at a basic level.³⁵ The barriers to achieving that goal are structural and political, rather than technical. But total self-sufficiency in food is not to the North's comparative advantage, any more than it is the South's. Even

now, if North Korean farmers could sell their produce freely, could receive convertible currency for those sales, and were allowed to purchase farm inputs and equipment that were economically beneficial, farm production would rise in very short order. Similarly, to the extent that the North Korean industrial and service sectors were able to produce a profit, some food could be imported to meet the domestic demand. As in the ROK, DPRK farmers would over time allocate resources and effort away from low value grains (especially maize) in favor of higher value vegetables, fruits and meat production.

In the event of unification, this is essentially the scenario that would confront North Korean farmers and workers. Unless considerable economic cooperation and integration had already developed over a period of years prior to unification, changes in market access would likely occur abruptly, whereas productivity would be slower to increase. This would be disruptive for northern farmers on many levels. First, their farms have already been de-capitalized by lack of investment over decades and they have little equipment, infrastructure or other resources to direct toward increasing production. This condition also holds at the household level. A large scale concerted plan of infrastructure investment in the North would be needed to overcome this structural barrier. Investment or loans equivalent to even one year of the ROK government's budget for rural support for the URAA changes (\$10 billion) would go a long way to meeting this need.

Second, North Korean farms would have to compete with more efficient ROK farmers. Only in the last few years have North Korean farmers been able to consider the relationship between production costs and the price received for farm products. Prices for farming supplies and food are currently distorted by scarcity, and the supply of certain crucial supplies (especially fertilizer) is simply not influenced by the price farmers would pay. Assuming that market restrictions were removed after unification, and that transport improved, farmers would have access to supplies and farming tools they can now only dream of, but little or no experience in determining the economically optimal level of use or investment. North Korean farmers learned basic technical skills but received cookie-cutter recommendations for farming methods. Planning and managing for annual changes in market prices, for example, and choosing among a suddenly rich list of products, seed varieties, etc. will take time to learn.

A third related concern is that North Korean farmers after unification would be required to devise their own farming plans, rather than just aim to fulfill a state mandated quota. Some will undoubtedly accept this challenge with enthusiasm and ability, while others will have difficulty adapting to the lack of state direction. A strong agricultural extension service mobilized in the North would be very helpful in ameliorating the negative consequences of this and the previous concern.

Organizational Changes

Farming is organized very differently in the North and South. ROK farms are small, privately owned, and diversified. Cooperation takes place among neighbors and some sharing or leasing of farm equipment occurs, but for the most part the enterprise is self-contained. Cooperative farms in the DPRK are “owned” by the state, and historically have been managed by a central staff, with delegation of work tasks and production quotas to work teams which are village-sized. Only in the last few years has there been any movement to individual responsibility at the household level. Assuming these policy changes hold, North Korean farmers will likely develop individual management skills and will invest time, resources and knowledge in improving the plot of land they have been assigned. What happens to the cooperative farms after unification is a critical question for the future of farming in the North. An apparently easy and logical approach would be to distribute the land to the sub work teams that are currently farming each parcel, but that would not provide for the administrative staff of the farm, or for members of specialized work teams responsible for machinery maintenance and operation, fruit trees, animal raising, etc. The national average figure for arable land per farm worker is 0.86 ha, which in a labor-intensive farming operation is a reasonable figure for management. A well managed holding of such size should easily produce enough food for a family and allow surplus for sale. The organizational question then becomes how to recognize the developing usufruct rights of SWTs under the 2012 and 2014 agriculture policy pronouncements and at the same time provide a productive resource for farm workers who did not have direct responsibility to a designated parcel of land.

Farm equipment in the north is mostly unsuited for small farms. Each farm’s stock of equipment was designed assuming that it would be moved around from SWT to SWT according to a plan devised by the cooperative farm managers. Today no farm has enough equipment to

accomplish all the needed tasks, but what little there is should be shared until a new stock of appropriately sized, modern, and fuel efficient tractors, rice planters, harvesters, small trucks, and other equipment is available. To preserve farming in the north after unification, the re-capitalization of farm infrastructure must be a top priority.

Reorganizing state farms after unification would be more difficult. Most are designed for specialized operations such as seed production, livestock, fruit or fish production; their fields, barns, ponds and processing equipment are designed for large-scale industrial farming. As on the cooperative farms, the productive capital is in a poor state. The existing management structure should be used and modified, while vesting some kind of ownership and profit sharing rights in the workers. Without immediate technical and economic guidance, these potentially productive enterprises would have a very difficult time competing with similar enterprises in the south.

Other elements of agricultural infrastructure in the north will also require attention. How will irrigation networks be managed and maintained if the farms that use them are now small and privately owned? Who will take charge of the grain storage depots and where will the vehicles and railcars needed to move farm supplies and farm produce come from? One can imagine farms or other organizations that have access to serviceable vehicles forming small transportation enterprises. Alternatively, South Korean transport companies could meet this need.

Substantial institutional resources reside in the Ministry of Agriculture (MOA), the National Academy of Agricultural Sciences, national and regional agricultural universities, and several specialized agricultural research centers. The MOA has traditionally been organized as a command and control network for setting priorities and quotas, as well as disseminating instructions about farming methods. After unification, this agency is best positioned to act as an agricultural extension service, as there are branches down to the county level, and staff familiar with the conditions at the farms. Considerable training and re-orientation would be needed to fully mobilize this resource. On the other hand, the many researchers involved in agricultural issues would likely welcome the opportunity for increased collaboration with their colleagues in the south. Integration of the research institutions would be challenging and require substantial investment in the north but would be beneficial to all parties concerned.

Northern farmers would need to learn how to produce and deliver goods in a different marketing system. Quality standards, certification and packaging will be dramatically different and require unprecedented adaptability by the farmers. These are areas that a newly tasked MOA extension service could address. Assuming that farm production in the north would be primarily distributed and consumed in the north for the first years after unification, there would be some time for farmers to learn about and adapt to the requirements for effective marketing that would ultimately govern their sales. A possible demand in the south for northern processed goods (soy sauce, *toenjang*, various liquors and confections, for example), similar to the preference for Pyongyang *raengmyeon*, would be of some advantage to northern farmers.

A third organizational concern regards the kind of development assistance that would flow to the north. Given the drastic difference in economies between the two halves of the peninsula, one must assume substantial flows of capital and information toward the north. Rebuilding and modernizing production infrastructure would be a high priority, and would absorb immense resources. Would these resources be delivered as grants, as investment, or as loans? Would they be managed by South Korean institutions or delegated to residual North Korean institutions? What about household-level production loans? Except for three successful but geographically limited projects by the International Fund for Agricultural Development (IFAD), North Korean farmers have no experience in managing farm loans and would require education regarding how such funding works and is repaid.

One also can anticipate the possibility of South Koreans taking undue advantage of the likely economic instability and change in the north. Would there be a land grab by investors or speculators from the south? Would there be initial restrictions on population movement to avoid either a mass exodus from the north to the apparently better living in the south, or a migration from the south to bring private investment into an area greatly needing imported resources of all kinds?

Personal Changes

Seventy years of socialist indoctrination, education and life in a centrally planned economy does not prepare people for life in a competitive market economy. International technical assistance personnel report that even at the policy levels, North Korean officials have had a difficult time understanding and relating to the principles of

market economics, banking and finance mechanisms. The reflexive calculations that a person makes are different in a market economy than in a planned economy.³⁶

Residents of the north will also lose the support and guidance of the state in decision-making, especially with regard to farm management. Initially farmers will likely continue past practices, as they have been reasonably effective. One does not (no matter what the economic system) make radical changes to one's livelihood when living on the margin of survival. But as free communication grows, opportunities to evaluate multiple options and decide among them will emerge. Unification will require a change in outlook and planning perspective for northern farmers. The last decades of economic crisis have already started this process. Slogans about a great and powerful nation or supporting the *songun* or *byungjin* policies will cease to motivate behavior or guide decisions, if they ever did. Farmers will need to evaluate their productive potential, the market for anything they may produce, and learn new skills of household or individual economic planning, saving, investing and budgeting. These changes in outlook and orientation are beginning under the North Korean economic policy changes, but will have to increase greatly if the two Koreas are reunified.

One advantage for the north in a unification scenario is the relatively young age of the rural population. A younger farming population would potentially be more able to adapt to changed economic and political circumstances, as well as to new farming methods. Even in the most optimistic scenario, it would take years for the northern industrial sector to revive to the degree it would influence rural to urban migration. A younger and potentially more dynamic rural work force would facilitate the necessary immediate changes in the farm sector that bring increased productivity and market access. Given the difficulty farmers in the south have in hiring enough farm labor, some opportunity for north to south migration might provide a different set of opportunities for northern farmers and their families.

A Longer Term Perspective

The discussion above is speculative. The consequences of North-South reunification will be affected by many factors, including the precipitating causes of unification, the governmental form it takes, and the speed with which it occurs. Regardless of the path, several actions could mitigate the disruption and household uncertainty that will most

likely occur in the north. Regarding the rural sector, planning for rapid and extensive investment to rebuild farming infrastructure would have immediate benefit and be extremely advantageous and relatively inexpensive on a per-capita basis. Roads, crop handling equipment, and irrigation pumps are especially needed. Short term loans to farm households would allow investment in productive potential that has long been missing. Priority needs include lime to counteract soil acidification, small walk-behind tractors for land preparation, and fuel and fertilizer. Education in market economics, as well as in how to assess the cost and profit of farm activities, how to develop a household budget, and the need for regular investment in equipment maintenance are among the factors that would help orient farmers in the north to the new economic system.

Farm production would likely increase rapidly given access to long unavailable supplies, as well as some adoption of better farming practices. As farmers gradually turn away from a cereals-dominated production model to grow higher value crops for the market, one can expect their profits to be invested in productivity-enhancing items—crop handling equipment, a long-term program of soil rehabilitation, motorbikes—and, as farming becomes less labor intensive, some people will inevitably migrate to urban occupations.

The lives of the elderly will likely be disrupted. What social safety net remains through the PDS and cooperative farm social welfare funds will likely disappear, leaving the elderly dependent on their children. Without appropriate planning and commitment by the South Korean government, the lives and well-being of this sector of the northern population could well be threatened.

Finally, at a structural level, we would expect the farm sector in the north to eventually follow a similar trajectory as in the south, moving from a goal of self-reliance in food production to export-financed food security. For many reasons rice may remain central, but if the half million hectares of rice paddy in the north produced an average yield of 7 tons per hectare, the harvest would provide about 90 kg of rice per person, just slightly less than South Korean farms produce. Price supports or similar measures may be needed to enhance rice farming in the northern half of a unified Korea, but the other million or so hectares of farmland can and likely would be used for much better purposes than growing maize and small grains. Livestock production will eventually also expand, but until the infrastructure is in place to support

concentrated farming,³⁷ we must expect the bulk of eggs and meat to come from small “backyard” activities at the many farming households.

All things considered, unification would be a difficult experience for the North Korean rural population. Without question, many people would be disadvantaged in the short term. But the long term structural and organizational changes would lay a foundation for a sustainable increase in the productivity and production of the farm sector, and better quality of life for the majority affected. Good planning to anticipate the changes and challenges, and a substantial government financial commitment to giving farmers in the north a start toward reviving their operations would greatly ease the transition, as well as ameliorate the inevitable problems.

Notes:

¹ C. Clyde Mitchell, “Land Reform in South Korea,” *Pacific Affairs* 22(2): 144-154. June 1949.

² The number of owner cultivator households exploded from 349,000 in 1949 to 1,812,000 in 1950. See Justin Maloney, “Land Tenure History and Issues in the Republic of Korea,” University of Maine, 2000.
<http://www.spatial.maine.edu/~onsrud/Landtenure/CountryReport/Korea.pdf>

³ Andrea Matles Savada and William Shaw, eds. *South Korea: A Country Study*, Washington: Library of Congress, 1990.

⁴ Oh Dae Ho, *Experiences in Rural Technical Revolution*, Pyongyang: Foreign Languages Publishing House, 1986; see also Kim Il Sung, *Theses on the Socialist Rural Question in our Country (1964)*, Pyongyang: Foreign Languages Publishing House, 1990.

⁵ Woon-Keun Kim “The Agricultural Situation of North Korea,” Food and Fertilizer Technology Center, Taipei, 1999. <http://www.ffc.agnet.org/library/article/eb475.html>

⁶ W. Randall Ireson, “Food Security in North Korea: Designing Realistic Possibilities,” Stanford University Asia-Pacific Research Center, 2006, p 9.

⁷ Eberstadt estimates an average of 800,000 MT/year of grain imports between 1987 and 1993, most from China. Nicholas Eberstadt, *The North Korean Economy: Between Crisis and Catastrophe*, New Brunswick, NJ: Transaction, 2007, pp 108ff.

⁸ See, for example, Asian Development Bank, *The Saemaul Undong Movement in the Republic of Korea*, Mandaluyong City, Philippines: Asian Development Bank, 2012. <http://www.adb.org/sites/default/files/publication/29881/saemaul-undong-movement-korea.pdf>

⁹ OECD, *Evaluation of Agricultural Policy Reform in Korea*, Paris, 2008, pp. 86-7. <http://www.oecd.org/tad/agricultural-policies/40383978.pdf> accessed 12 June 2015.

¹⁰ Asia-Pacific Information Platform on Food Security, “Ratio of Food Self-Sufficiency in Korea (Overall).” http://www.apip-apec.com/kr/statistics/files/Korea_Food_Self-Sufficiency.pdf

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- ¹¹ David von Hippel & Peter Hayes, *Foundations of Energy Security for the DPRK*, Berkeley, CA: Nautilus Institute, 2012, pp .8, 37, *passim*. http://nautilus.org/wp-content/uploads/2012/12/1990-2009-DPRK-ENERGY-BALANCES-ENGAGEMENT-OPTIONS-UPDATED-2012_changes_accepted_dvh_typos_fixed.pdf
- ¹² Barbara Demick, *Nothing to Envy*, New York: Spiegel & Grau, 2010 gives an excellent description of how food scarcity was perceived in the Northeast provinces. Also see Stephen Haggard & Marcus Noland, *Famine in North Korea: Markets, Aid and Reform*, New York: Columbia University Press, 2007.
- ¹³ Double cropping involves planting wheat in the late fall or barley or potato in the early spring and harvested in early June to provide a small harvest prior to the main crop.
- ¹⁴ See WFP Food Aid Information System summary data at: <http://www.wfp.org/fais/reports/quantities-delivered-two-dimensional-report/run/code/CEREALS+%28aggregate%29/year/All/cat/All/recipient/Democratic+People%27s+Republic+of+Korea+%28DPRK%29/donor/All/mode/All/basis/1/order/0/>
- ¹⁵ See again Demick, *Nothing to Envy*, and Haggard and Noland, *Famine in North Korea*.
- ¹⁶ As explained to me by several DPRK agricultural officials in Sept 1999, farms received 0.7 KPW/kg for paddy rice, and 0.45 KPW/kg for maize. Milled rice was “sold” through the PDS at 0.23 KPW/kg, or less than 20% of what the government paid for it. The maize sale price was similar. Farms were charged between 0.38 and 0.45 KPW/kg for urea fertilizer.
- ¹⁷ Prices were 29 and 20 KPW/kg for paddy rice and maize, respectively, and the price of grain distributed through the PDS became 46 and 24 KPW/kg for milled rice and maize. UN Food and Agriculture Organization, *FAO/WFP Crop and Food Security Assessment Mission to the Democratic People’s Republic of Korea*, Rome: FAO/WFP, 2004 (henceforth cited as *CFSAR* and year) and personal report by DPRK ag officials in Sept 2002.
- ¹⁸ *CFSAR* 2004 p 4.
- ¹⁹ Multiple conversations with cooperative farm managers and agricultural officials in March and Sept 2005.
- ²⁰ See John Everard, “The Markets of Pyongyang,” Korea Economic Institute Academic Paper Series 6(1), January 2011.
- ²¹ *Timelines of History. Timeline North Korea*. <http://timelines.ws/countries/KOREANORTH.HTML>
- ²² See *CFSAR* 2011, p 9; and Rudiger Frank, “Currency Reform and Orthodox Socialism in North Korea,” Policy Forum Online 09-092A: December 3rd, 2009. <http://www.nautilus.org/fora/security/09092Frank.html>
- ²³ See “6.28 Policy goes live in 3 Yanggang counties,” *Daily NK*, July 20, 2012. <http://www.dailynk.com/english/read.php?cataId=nk01500&num=9551>, and “North Korea’s new economic management measures stalled,” *NK Briefs*, Institute for Far Eastern Studies 18 October, 2012. http://ifes.kyungnam.ac.kr/eng/FRM/FRM_0101V.aspx?code=FRM121018_0001. Two representatives of aid programs in the DPRK report that in 2014 the reforms seem to be much more widely, if not universally, implemented.
- ²⁴ Kim So Yeol, “Cabinet Acknowledges June 28th News,” *Daily NK*, 13 May 2013, <http://www.dailynk.com/english/read.php?cataId=nk09002&num=10565>; Lee Sang Yong, “Agricultural Madness Angers Farmers,” *Daily NK*, 5 July 2013. <http://www.dailynk.com/english/read.php?num=10713&cataId=nk01500>; Park Hyeong-

jung, “North Korea’s ‘New Economic Management System’: Main Features and Problems,” *Korea Focus*, October 2013, http://www.koreafocus.or.kr/design3/essays/view.asp?volume_id=146&content_id=105092&category=G; at the end of 2013 the FAO reported no evidence of any changes in agriculture market policy: FAO/WFP, *Crop and Food Security Assessment Mission to the Democratic Peoples Republic of Korea*, Rome: FAO and WFP. See pp 9-11. <http://www.fao.org/docrep/019/aq118e/aq118e.pdf>

²⁵ Randall Ireson, “Game-Changing Agricultural Policies for North Korea?” *38 North.org*, February 26, 2014. <http://38north.org/2014/02/rireson022414/>

²⁶ “May 30th Measures and IFES Report,” *Choson Exchange blog*, December 3, 2014. <http://www.chosonexchange.org/our-blog/2014/12/3/may-30th-measures-and-ifes-report>

²⁷ Not for attribution discussion among members of the National Committee for North Korea, 2015.

²⁸ <http://www.ncnk.org/resources/briefing-papers/all-briefing-papers/macroeconomic-statistics-and-the-dprk>

²⁹ “Hyundai Research Institute: DPRK Economic Report for 2013,” 16 March 2013 in NKEcon Watch. <http://www.nkeconwatch.com/category/statistics/gdp-statistics/>

³⁰ “North Korea’s Economy – Economic Data,” Washington: Korea Economic Institute, 2008. <http://www.nkeconwatch.com/nk-uploads/KEI-NK-DATA-2008.pdf>

³¹ Korea Economic Institute of America. “Leading Indicators South Korea.” <http://www.keia.org/pagefullwidth/leading-indicators#>

³² See my discussion elsewhere regarding the structural conditions necessary for DPRK farmers to meaningfully increase their productivity: Randall Ireson, “Agricultural Reform Again – or Not?” *www.38north.org*, U.S.-Korea Institute of the School of Advanced International Studies, 2012. <http://38north.org/2012/11/rireson111512/>

³³ Economic Research Service, USDA, “South Korea - Policy”. <http://www.ers.usda.gov/topics/international-markets-trade/countries-regions/south-korea/policy.aspx>

³⁴ Ministry of Unification, *2014 White Paper on Korean Unification*, Seoul, 2014.

³⁵ Randall Ireson, “Why North Korea Could Feed Itself,” *www.38north.org*, U.S.-Korea Institute of the School of Advanced International Studies, 2010. <http://38north.org/2010/05/why-north-korea-could-feed-itself/>; Randall Ireson, “Developing the DPRK Through Agriculture,” *www.38north.org*, U.S.-Korea Institute of the School of Advanced International Studies, 2012. <http://38north.org/2012/02/rireson020812/>

³⁶ My experience working in 1990 in southern Laos brought this home. In a planning exercise with province and district level officials to identify ways of improving the farm economy under the Lao “New Economic Mechanism”, after only about 20 years under socialist governance, the first response to any question about improving quality or efficiency was “the government should decree that ...” rather than investigating what individuals could do, or how targeted education could change farmer behavior to produce something that was more acceptable to domestic or international consumers.

³⁷ For example feed mills, transportation for feed and animals, equipment and repair systems for managing livestock barns, and a veterinary service would all be required and are currently very inadequate in the DPRK.