How to increase food security in North Korea?

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Keywords: North Korean agriculture, food security, self-reliance, intensifying agricultural production, increasing yields.

Summary findings, conclusions, recommendations

In North Korea, in conformity with the still prevailing Juche ideology, food self-reliance seems to be the main objective in order to increase food security. The only option for boosting domestic food supply is to intensify agricultural and food production, as the possibilities for an extensive production increase are rather limited, due to natural, climatic and ecological conditions. The article analyses those less energy-intensive, less costly, but more cost efficient and environmentally friendly farming methods and practices, which might lead to sustainable self-sufficiency via sustainable productivity. Though technical developments have a vital role in increasing labour productivity and yields, a conducive economic environment is also essential for increasing domestic food supply.

Food security

Food security is a top priority for each country all over the world. It means:

a) *availability* of (staple) food in sufficient quantity[1], quality[2] and at reasonable price,

b) *accessibility* to food by the entire population, as food is one of the main basic needs, and

c) *limited dependence* on outside sources of supply.

Though food always used to be a strategic item (like crude oil), its significance is gaining momentum as a consequence of forecasted food price increases and growing competition for land and water.

In order to reach *objective a)*, namely food availability, a country has the following options:

• to increase its domestic food production in order to achieve *(partial) food self-sufficiency,*

• if food self-sufficiency is only partial, there is need for *food import,*

• if none of the above is fully feasible, there is a need for *food aid.*

In order to achieve *objective b)*, namely accessibility to food by the entire population, the following conditions should be taken into account:

• the *purchasing power* (the income) of the population,

• the *distribution* of the available income, and

• different *domestic* food aid and social programmes.

How to achieve food self-sufficiency?

In the case of North Korea, in conformity with the juche ideology, (partial) food self-reliance still seems to be the main objective in increasing food *availability*. All the more, as food aid is very unpredictab-

[1]According to FAO's 2004 estimates (FAO, 2004, Special Report ...) the minimum consumption requirement of the 23.7 million North Korean population is 5.1 million tons of grain equivalent, while the actual production was 4.3 million tons in 2004.
[2]In 2004 only 55% of the protein need could be met.

le, unreliable and politically driven. Humanitarian aid can provide but a temporary solution to food shortage and famine. Instead of food aid, development aid directed to agriculture or donations of fertilisers are more meaningful and cost-effective for increasing food availability. As far as *food import* is concerned, it is possible, but less and less feasible under the conditions of decreasing export revenues and increasing world market prices, let alone the dependence on food shipments.

Consequently, the main possibility for increasing (partial) food self-sufficiency is to increase domestic food supply. In theory there are two options for *increasing domestic food production*: the *extensive* and the *intensive* way.

In North Korea the possibilities for an *extensive* production increase are rather limited due to natural, climatic and ecological conditions: only 14-16% of the country's territory can be cultivated and the land under cultivation cannot be increased significantly as the entire peninsula is mountainous; the arable land is about 2 million hectares, of which 1.4 million hectares are suited for cereal production, the per capita arable land is only about 0.06 hectares; the average frost-free period is short. In addition, the number of agricultural employees cannot be increased significantly either. There has been a massive outflow from rural areas to urban ones as agricultural activity is not a lucrative one in spite of increasing procurement prices. In addition, as agricultural production has been industrialised, less and less labour force was needed.

The other possibility is to *intensify* agricultural and food production via increasing labour productivity and yields, especially in the case of the main crops (rice, corn, barley, soybean etc.).

How to increase (grain) yields?

"Modern" technical means for increasing yields

During the 1950s and 60s North Korean agriculture managed to increase grain yields and production significantly, and by the 80s the country had already produced enough food to feed its population thanks to the following technical developments:

- mechanisation (use of tractors, harvesters and other machinery),
- chemicalisation (use of fertilisers, pesticides, herbicides, fungicides),
- electrification,
- improved seeds, and
- irrigation.

The application of the above inputs was very successful from the point of view of reaching (partial) self-sufficiency through increasing grain yields: the annual grain production in the DPRK rose to over 8 million tons by 1989. However, the highly industrialised agrarian model based on the above "pillars" turned out to be *unsustainable* after a while as a consequence of increasing energy, fertiliser and other input prices, not to speak of the economic and environmental consequences (high costs[3], low cost efficiency, diminishing returns, soil erosion, decreasing soil fertility, exhaustion of the soil, salination of the land, deforestation etc.)

"New" solutions for increasing grain yields

The main aim is to apply less energy-intensive and less costly, but more cost effici-

[3]To increase rice yields from 7 to 9 tons/hectare was more expensive due to intensive fertilisation than buying the same two tons of rice on the world market (Ireson, 2006, p. 6).

ent and environmentally friendly farming methods and practices, that is, to reach sustainable self-sufficiency via *sustainable productivity.* If North Korea insists on increasing its self-sufficiency through intensifying and revitalising its agricultural production, the following opportunities are available among others. Some of them are totally new technical, agronomic, biological and engineering developments, while others are well-known though (sometimes) neglected traditional forms of increasing yields.

• *Fertilisation:* in order to regain and increase soil fertility, fertilisation must be continued, however, chemical fertilisers should be supplemented by or substituted for organic manure (via encouraging animal keeping, like goat), green manure (by planting winter green manure crops, like hairy vetch[4]), and through crop residue management, which means the returning of crop residue (rice straw and corn stalks) into the soil; local production of green manure seeds should also be promoted.

• *Mechanisation, mechanical innovations:* modernising machinery (tractors, rice transplanting machines, threshing machines, trucks), applying less energy-intensive and more energy-efficient equipment (like tractor-driven rotary disk ploughs, seed drills for wheat[5], corn and soybean), plus to pay special attention to maintenance, repair, spare part availability and training.

• *Irrigation* is of vital importance, as the normal yearly rainfall is not optimal for crop performance and is unevenly distributed since spring is often dry, while 60% of the rainfall comes between mid-June and mid-September; consequently, supplemental irrigation during the early growing season can significantly improve yields; the presently used old and energy-intensive irrigation system of pumps and reservoirs should be changed or repaired, however, shortages of electric power and diesel oil will remain bottlenecks.

• *Rain-fed field cultivation* (for corn, wheat, potato and vegetables): though these fields are not irrigated, yields could be increased by supplemental irrigation (by simple moveable sprinkler systems, small portable diesel pumps, sprinkler lines, making use of groundwater sources).

• *Dry-land farming development:* the main objectives are to enhance the moisture retention capacity of the soil, to retain rain, to improve soil fertility, to turn soil-, water- and fertiliser-losing land into soil- water- and fertiliser-conserving land, to make full use of resources in order to increase yields; major measures include: terracing, reforestation, furrow drilling, water cisterns, mulching, coating, deep tillage, use of drought-enduring and drought-resistant seeds etc. *(Zhu Yu, 2007).*

• *Improved seeds/varieties, GMOs:* to apply long-maturity varieties in the case of corn and rice with due regard to the short frost-free period; to breed new rice and corn varieties that make more efficient use of soil nutrients, that use less chemicals, are more resistant to pests and diseases *(Ireson, 2006)*; to use hybrid corn seeds on a regular basis; to use other crop varieties, including GMOs with the ability to resist drought, floods, diseases, pests.

• *Development of extension services* in order to transfer research findings and agronomic advice to farmers.

• *Crop rotation:* to rotate grain (corn or wheat) with non-cereal crops (legumes, soybeans) in order to prevent the drainage of soil nutrients, soil structure degradation, deterioration of soil productivity and to interrupt disease and pest cycles

[4]This type of fertilisation typically increases rice yields by about 1 tons/hectare in the first year.
[5]Wheat yields are increased by about 0.5 tons/hectare due to better plant vigour (Ireson, 2006).

etc.; a 10% increase in the yield of corn can be expected as a result of improving soil fertility.

• *Double or multiple cropping:* grain-on-grain (winter wheat – spring barley) production is an option, though farming needs a significant fertiliser input.

• *Crop diversification:* to counterbalance the over-emphasis on grain production and to move towards cropping of legumes (soybean, lentils, bean, dry peas) in order to add protein to the diet, and also contribute nitrogen to the fields.

• *Sloping lands* should be planted with permanent crops, including fodder: it stops erosion and makes feed available for livestock.

• *Traditional knowledge* of adaptive farming methods (like green manure) should not be ignored.

• *Organic farming – green farming* (yugi nongpop) means mainly less chemical (fertiliser, pesticide etc.) use, which is recommendable not only because of the increasing costs of the inputs concerned, but also of the less harmful effects on the environment; though higher productivity is not guaranteed, better and healthier produce might be a compensation.

• *Reducing post-harvest losses:* according to FAO estimates *(FAO, 2004)* post harvest losses equal 15% of grain production; the main causes are delayed transport and poor storage, which could be overcome by developing rural infrastructure (transport, processing, storage, distribution); it is easier to curb losses than to increase production; one of the possibilities is the application of simple mobile (portable) threshing machines in the case of rice, which can speed up processing and save 5-10% of crop production.

It is an important question how the above-suggested changes could be realised primarily from a financial point of view. It is beyond the scope of this article to answer this question.

Economic environment

Though technical developments have a vital role in increasing grain yields, conducive economic environment is also essential in the agrarian sector as well as in the whole economy to increase domestic food supply. The example of the transition economies of Central and Eastern Europe shows that *transformation* (changing ownership, land use system and organisational structure), *marketisation* (deregulation, the increasing role of market, competition, prices, incentives, abolishing compulsory deliveries) and *liberalisation* (the opening up of the economies, price liberalisation) might have a significant impact on increasing agricultural productivity. These changes contribute to creating economies of scale, increasing cost efficiency and profitability, providing economic (price) incentives, generating income and accumulation and decentralising management.[6] However, the changes should be gradual in order to avoid undesirable social consequences.

Though all the decisions at the macro-level (like central planning or economic reforms) are very essential, none of them can be accomplished without the active participation of the people concerned. In the case of agriculture, people's adaptive behaviour, their traditional knowledge and initiatives cannot be dispensed with.

Accessibility to food

To increase domestic food production through increasing yields is not a purpose in itself. The final objective is to meet the

[6]From this point of view, the North Korean economic reforms in the field of agriculture are noteworthy *(Kim Young-yoon – Choi Soo-young, 2005).*

(increasing) food demand of the population. In order to achieve this goal, the purchasing power of the people should be strengthened via increasing incomes in accordance with their performance.

References

(1) FAO (2004): Special Report: FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea, Rome, Food and Agriculture Organisation – (2) Feffer, J. (2004): Korean Food, Korean Identity: The Impact of Globalisation on Korean Agriculture. Manuscript, 54 p. – (3) Hernádi, A. (2002): Hungarian Lessons for North Korea's Economic Transition. International Journal of Korean Unification Studies, Vol. 11, No. 2, 201-219. pp. – (4) Hunag, J. – Scott, Rozelle (1995): Environmental Stress and Grain Yields in China. American Journal of Agricultural Economics, Vol. 77, No. 4, pp. 853-864. pp. – (5) Hwang, Dong-eon (1997): Agricultural Reforms in North Korea, and Inter-Korean Cooperation. Information Service on the Unification Question of the Korean Peninsula, Oct 31 25-43. pp. – (6) Randell, I. (2006): Food Security in North Korea: Designing Realistic Possibilities. The Walter H. Shorenstein Asia-Pacific Research Centre, Stanford University, 28 p. – (7) Kim Young-yoon – Choi Soo-young (2005): Understanding North Korea's Economic Reforms. Center for the North Korean Economy, Korea Institute for National Unification, Seoul, 57 p. – (8) Mansourov, A. Y. (2006): Economic Take-off Possibilities and National Security Realities in the DPRK. The Journal of East Asian Affairs, Vol. 20, No. 2, Fall/Winter, 35-77. pp. – (9) Mckay, J. (2002): The Food Crisis in the DPRK: Prospects for Policy Reform. International Journal of Korean Unification Studies, Vol. 11, No. 2, 143-172. pp. – (10) Moon-Young Huh (2007): North Korea's 2007 New Year's Joint Editorial, Analysis and Prospects. Korea and World Affairs, Vol. XXXI, No. 1, Spring, 5-12. pp. – (11) Lee Dong-hwi (2007): Reforming and Opening North Korea's Economy: Evaluation and Prospects. Korea Focus, Vol. 15, No. 2, Summer, 129-142. pp. – (12) The State of Food and Agriculture, 2005, FAO, 2005, Rome – (13) Zhu Yu (2007): China's Dryland Farming and Practices. Manuscript, 7 p. – (14) www.koreascope.org

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