

# ORGANIC FARMING AND THE SUSTAINABILITY OF AGRICULTURE IN KOREA

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## ABSTRACT

*We have been talking about organic farming and sustainable agriculture for more than a decade. Many scientific meetings have been organized to discuss these themes. It appears, however, that up until now the results have been more rhetorical than practical. Hundreds of papers have been published on the potential damage which chemical fertilizers can do, while the mass media have been warning the public that the continued heavy use of chemical fertilizers and pesticides will lead to catastrophe. However, there is no sign that the use of chemical fertilizers has declined. This may reflect the fact that as far as these issues are concerned, there seems to be a big gap between the ideal situation people talk about, and what can be done in practice. It appears that this phenomenon is not confined to the agricultural sector. In every sector in every nation, both developed and developing, people are assiduously seeking "growth" while talking about "limits to growth".*

*In Korea, a small number of farmers are known to be engaged in organic farming. The practices they follow, however, in the name of organic farming are not consistent, nor are their motives or the soundness of their technologies. Some of them are attempting to produce "clean food" (asking a higher price for it than for ordinary produce), aimed at those consumers who can afford it. The "cleanliness" of such products has not yet been clearly defined. Both producers and consumers believe that using organic manure (mostly containing animal dung) in place of chemical fertilizers, and not using the chemically synthesized pesticides, are an assurance that "clean food" is being produced. The reliability of this belief has not yet been critically examined. People tend to believe that organic farming is more sustainable and more friendly to the environment than conventional farming. This belief needs close examination. In this paper, I attempt to analyze what Korean farmers understand by the concept of organic farming, how they practice it, the problems involved, and how it should develop.*

## WHAT DO PEOPLE UNDERSTAND BY ORGANIC FARMING?

Almost everyone who knows something about agriculture seems to have an opinion on organic farming. Accordingly, the ways in which people understand the concept of organic farming are not consistent. Some people are quite flexible, while others are very rigid. For some people, organic farming is a cult, while for others it means a slight

modification of the farming practices that are currently being followed. There is no consensus on the definition of organic farming in Korea, particularly in scientific circles. There has not even been any serious attempt to reach a consensus. There seems, however, to be a loose agreement that organic farming emphasizes the use of organic materials in place of chemically synthesized fertilizers, and discourages the use of agricultural chemicals for the protection of crops. The Ministry of Agriculture, Forestry, and Fisheries (MAFF) of Korea, has attempted to define two categories of organic farming,

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the “narrow definition” and the “broad definition” (MAFF 1993). According to the “narrow definition”, organic farming is farming that does not use any chemical fertilizers or chemical pesticides, and uses organic manure, naturally occurring minerals and other naturally occurring materials. According to the “broad definition”, on the other hand, organic farming is farming that uses the minimum possible rates of chemical fertilizers and other agricultural chemicals in combination with organic manure and naturally occurring substances. Why two definitions? There is good reason for this. The “narrow definition” is necessary as a legal device for the recognition of organically produced farm products in the market, in order to protect the consumer. Farmers who are practicing organic farming want to differentiate their product from ordinary farm produce by using the label “Organic Farm Product”. The Korean Ministry of Agriculture insists that any farm product carrying the label “Organic Farm Product” should be produced in accordance with the “narrow definition” of organic farming. The “broad definition” of organic farming reflects a pragmatic approach to the issue of sustainability in agriculture. It implies that the extremes of either chemical farming or organic farming are undesirable. A moderate approach takes advantage of both organic farming and chemical farming. This definition is for farmers generally (Hong 1994). In other words, the Ministry recognizes the problems involved in completely organic farming, and is hesitant about encouraging the practice on a large scale.

There are staunch believers in organic farming, particularly among laymen. They tend to believe that organic farming is a cure-all, making farming friendly to the environment, improving the quality of farm produce, and prolonging the sustainability of agriculture. They deny any possible contribution from chemical fertilizers and other agricultural chemicals. Rather, they regard these chemical products as destroyers of the environment, dangerous to both producers and consumers. An NGO, the Korean Organic Farming Association (KOFA) is strongly advocating these views.

### **HOW DO FARMERS PRACTICE ORGANIC FARMING?**

The emergence of the concept of organic farming in Korea dates back to the early 1970s (KREI 1990). It was voluntary groups of laymen who initially took the lead in promoting organic farming in Korea, as in other parts of the world. KOFA claims that current membership of the

association stands at over 80,000.

A survey on the adoption of organic farming by farmers (ASI 1992) revealed that the number of farmers who practiced organic farming was surprisingly small, considering the loudness of the voices talking about it, at only 1,200. Furthermore, it was also revealed that not all of the farmers who said they were practicing organic farming followed the “narrow definition” (which is the one encouraged by KOFA). Of the farmers who identified themselves as “organic” farmers’, it was revealed that about 50% applied chemical fertilizers and/or pesticides, although at reduced rates. However, the small number of farmers practicing authentic (?) organic farming does not necessarily mean that farmers in general do not recognize the value of organic matter in agriculture. In Korea, the use of organic manure is still popular, although dependency on it has been significantly reduced with the intensive use of chemical fertilizers. Formerly, organic manure played a key role in supplementing plant nutrients for standing crops, and in building up long-term soil fertility. In recent years, chemical fertilizers have been used for the short-term supplementing of plant nutrients for standing crops, while organic manure is used mainly to build up long-term soil fertility.

### **Why Organic Farming?**

The reasons why farmers opt for organic farming differ from one person to another. Two surveys were made of the reasons why farmers adopted this type of farming, one by the Korean Rural Economics Research Institute (KREI) in 1990, and another by the Agricultural Sciences Institute (ASI) in 1992. The two surveys had similar questions, but farmers gave different responses. These are summarized in Table 1.

The survey results indicated that the motives of farmers in adopting organic farming were not consistent. What was striking is that the majority of the farmers were not practicing organic farming for the sake of higher profits, nor because they were seeking to follow sound farming practices. A sizable number of farmers opted for organic farming simply to avoid the dangers involved in using pesticides. The farmers belonging to this category have often had an unfortunate experience with agricultural chemicals. Many of these did not manage their farms well, so that crops performed poorly. In short, when viewed from the point of view of the motives of farmers for practicing organic farming in Korea, it can be said that although there has been a lot of talk about organic farming on philosophical grounds, the

Table 1. Motivation of farmers in adopting organic farming, according to surveys by different institutions

Motivation	KREI	ASI
Higher profitability	9.3	21.0
Religious belief	4.9	-
Social obligation to produce safe food	-	22.2
To avoid the danger of pesticides	43.1	16.0
Encouragement by KOFA	28.5	30.8
Recommendation by neighbors	4.9	-
Demand from consumers	4.5	4.6
Others	4.9	5.4
No. of farmers surveyed	246	500

Source: KREI 1990, ASI 1992.

practice of organic farming is at an initial stage, and there is a great deal of confusion.

### Problems Involved in Organic Farming in Korea

As pointed out above, the dominant motives of most farmers opting for organic farming are neither consistent nor sound. A sizable proportion of farmers practicing organic farming are doing so mainly to escape the risks involved in using agricultural chemicals, and their farming performance is sub-standard. Of course, everyone is at liberty to run one's own business in the way that he or she wishes. There is, however, a certain degree of social obligation that everyone shares in doing this. Surveys conducted by various institutions in Korea have revealed that 40 to 50% of farmers in the country have had some kind of unpleasant experience in using agricultural chemicals (Lee 1993). If all farmers were to decide to abandon the use of chemicals because of the risks involved, without an appropriate alternative means of getting good results from farming, the entire society, including the farmers themselves, will suffer in the long run. One of the basic problems in the campaign for organic farming is that not enough attention is being paid to the economic aspects of farming. Many laymen argue that economic returns are less important than making sure that farm practices are environmentally sound and food is healthy. However, it seems obvious that if any farm practice is not economically sustainable, it will not survive for long (Parr 1993).

Organic farming as practiced by farmers in Korea also has serious technical problems. One is

the overuse of organic manure. Traditionally, Korean farmers have attached a high value to organic manure. Before chemical fertilizers came into common use, organic manure was a vital resource for Korean farmers. Thus, there is a tendency to believe "the more, the better", so far as the use of organic manure is concerned. This attitude has deep roots. In the old days, obtaining a supply of organic manure was not at all easy. Generally, agricultural by-products serve as the major source of organic fertilizer. In Korea, however, in the past, circumstances did not allow this. Rice being the major crop, the main agricultural by-products were rice straw and rice hull. In those days, rice straw had numerous uses: thatching roofs, making various containers and even shoes, and feeding animals. Rice hull was used mainly as fuel. Thus, the only way to secure organic manure was to collect grass from the hill-sides. Collecting bulky grasses from hill-sides and carrying them home was back-breaking work in those days, when both the tools and the roads were very inadequate. Naturally, organic fertilizer was scarce, and farmers were hungry for it.

With this background, the attitude of "the more the better" towards organic manure persists even today. Surveys on the use of organic matter by farmers who are practicing organic farming revealed that some farmers are using as much as 110 mt/ha/year (KREI 1991). To make the situation worse, the organic matter that farmers use today contains a large quantity of readily available plant nutrients; N, P, and K (on average, 1%, 0.8%, and 2%, respectively, at a moisture content of about 65%), since fertilizer is often prepared by mixing sawdust with animal wastes. The incautious use of organic matter

in the name of organic farming results in a very high accumulation of nutrients and organic matter in the soil. Table 2 shows a typical example of the chemical properties of soil where organic farming had been practiced for ten years.

An additional study of the soil presented in Table 2 indicated that the readily available N(NO<sub>3</sub>) content and electrical conductivity are also much higher than in an ordinary soil (Kwangam Whang, personal communication). A high accumulation of plant nutrients in the soil causes various problems. Among other things, it affects the quality of the produce, one of the main justifications for organic farming. A recent survey found that vegetables produced in soils with a high nutrient content had an unusually high nitrate content of as much as 3,000 ppm NO<sub>3</sub> (Son 1993). A high accumulation of plant nutrients in the soil also pollutes the environment. As well as the possible eutrophication of surface water with accumulated phosphorus from the soil, the accumulation of nitrate in soils leads to a deterioration in the quality of underground water. A survey on the distribution of nitrate in the soil profile has confirmed this (Yoon and Kim 1994). The survey results indicated that the nitrate-N concentration in the soils at a depth of 60 cm was as high as 100 ppm.

The second major technical problem in organic farming is the use of biotic products and enzymes, which are being widely sold to organic farmers but have not been shown to have any significant effect. There are so many of these products, and the effects claimed for them are so diverse, testing by the relevant government institutions is difficult. In spite of this, experiments have been conducted to see whether some of these products are effective. The results obtained so far do not generally agree with the claims being made by the manufacturers and dealers (ASI 1993). Still, their use persists in organic farming circles.

There are also problems of diseases and insect damage associated with organic farming. When the use of pesticides is completely eliminated, some crops suffer serious losses. Table 3 presents an example of such a situation, with 100% of cucumber grown by organic farming methods infected with downy mildew, compared to 10% if conventional farming methods were used. Similarly, organically grown cabbage suffered more from attacks of aphids and diamondback moth.

## RESEARCH ON ORGANIC FARMING IN KOREA

Research on the effects of applied organic matter has been one of the most important research subjects since research began into soil fertility management. However, systematic research on organic farming as such did not begin in Korea until the late 1980s. The first aim was to understand why farmers are using particular practices in their organic farming. On the basis of the information obtained so far, the focus is now shifting to the development of more effective farming systems involving organic farming as one component. We are tending to look at organic farming as one means of achieving sustainable and environmentally sound farming systems. The important research topics are as follows.

- The behavior of plant nutrients in various kind of organic manure applied to soils, with special reference to the short- and long-term effects of replacing chemical fertilizers
- Development of methods for manufacturing organic manure from various industrial by-products and organic wastes, emphasizing the conversion of environmentally burdensome substances

Table 2. Example of soil chemical properties where organic farming had been practiced for 10 years, in comparison with average soil

	pH (1:5)	Organic matter (%)	Available P <sub>2</sub> O <sub>5</sub> (ppm)	Exchangeable cations (me/100g)			
				K	Ca	Ng	Na
	6.5	7.4	2,270	1.5	8.4	5.7	0.5
A	5.8	1.9	231	0.6	4.6	1.4	-

Source: Organic farm; Agricultural Sciences Institute 1992  
A: (Korean national average); Agricultural Sciences Institute 1989

Table 3. Occurrence of disease and insect damage in vegetables under different farming methods

Farming method	Cucumber		Cabbage	
	Downy mildew	Aphid	Diamondback moth	
Conventional	10	-	50	
Organic	100	80	100	
Mixed*	10	-	20	

\* Mixed farming: Organic manure was used in combination with fertilizer and pesticides

Source: ASI 1993

into productive resources in the agricultural system.

- Development of farming systems suited to different agricultural zones, using different technological components such as organic farming
- Development of farming systems which exist in a high-quality environment generated by environmentally friendly farming systems such as organic farming, and making such farming systems economically more profitable.

Why these subjects? First of all, we need to be able to tell farmers on scientific grounds how much (and when) to use different kinds of organic manure. Unfortunately, however, there are many gaps in our information about the short- and long-term release of plant nutrients from different types of organic materials which differ from conventional compost. Secondly, the development of methods for manufacturing organic manure from organic by-products is of vital importance. Korea has large amounts of organic by-products from various sources. In 1991, the annual production of livestock manure was 34 million mt, containing 736,000 mt of major plant nutrients (N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O) (Kwangyong Chung, personal communication). This was equivalent to 80% of the major plant nutrients used in the form of chemical fertilizer in the same year. In addition, the annual production of organic by-products from various industries amounted to 252 million mt (Kim and Shin 1993). The total amount of major plant nutrients contained in these by-products was estimated to exceed the country's annual nutrient requirement for all its crops (Kwangyong Chung, personal communication). Currently, however, the use of these by-products is nominal except in the case of livestock manure, about 60% of which is used. If not used, these by-products can cause serious environmental problems. Thus the efforts to absorb them into

agricultural systems in a productive way is of the utmost importance.

Thirdly, it may not be reasonable to expect that a certain farming system is suited to all conditions. The ultimate aim in agriculture is not the adoption of any particular farming system such as organic farming, but the realization of sustainability in a broad sense, satisfying both the physical and the economic aspects. In Korea, it is anticipated that the differentiation of farming according to geographical zones is a probable option for the development of agriculture, to cope with the new socio-economic circumstances of the coming years.

For instance, at present rice is cultivated everywhere in Korea on very small operational units, even on narrow terraces in valleys, with heavy use of fertilizers and other agricultural chemicals. Current practices are disadvantageous in two respects. Firstly, since the operational units are very small, rice cultivation is not cost effective, and hence is not competitive. Secondly, cultivating rice in terraced valleys with heavy applications of agricultural chemicals results in the pollution of upper streams. To rectify this situation, rice cultivation will have to be concentrated in the major plains, where the scaling up of operational units is more feasible. In water catchment areas, other farming systems that are more friendly to the environment will have to replace rice. This strategy may be interpreted as follows: for the cultivation of rice in the plains, economic sustainability is emphasized, while in the upper stream areas, environmental sustainability is emphasized.

This, however, does not necessarily imply that cultivation of rice in the plains, will neglect the environmental aspects. Every possible means to reduce the burden to the environment will have to be used. Technology for achieving this is being developed. There are indications that the application of fertilizers can be reduced by at least 30% by means of slow release fertilizers (Hong and Lee 1971), and

if soil testing is practiced as the basis for fertilizer recommendations. Similarly, pesticide use may be reduced by 50% through integrated pest management (Munhong Lee, personal communication). A preliminary study on the emission from rice fields of methane gas, one of the most important gases in the "greenhouse effect", found that there is a marked reduction with proper water management (Shin 1994). In short, the development of farming systems suited to different agricultural zones will be a matter of high priority in the foreseeable future. Lastly, special attention should be accorded to the economic aspect. When emphasis is placed on the environmental soundness of agriculture, often the farm economy is ignored. Even when environmental aspects are emphasized, the economic aspect of farming should be taken into account.

It is possible that a good-quality environment resulting from the adoption of environmentally sound farming practices, which may be some extent sacrifice productivity of the main component of farming (e.g. crop yield), can be utilized for the generation of extra income. Suppose that a special agricultural zone is developed and an unpolluted environment is created. Can we not think of some way in which farmers can use this environment to generate income? For instance, in one village where all the farmers are practicing organic farming, a farmer may be experimenting with pond snails in combination with rice. Pond snails can be an income source, and at the same time they feed on weeds in the field, eliminating some of the labor needed for weeding. Such an attempt is possible only when no agricultural chemicals are being applied. There seems to be a wide scope for this kind of attempt, but it has not yet been explored. Initial research work is now being carried out in this direction.

### THE PROSPECTS FOR ORGANIC FARMING IN KOREA

At least for the time being, Korean agriculture cannot completely abandon conventional farming and the use of agricultural chemicals. This does not, however, imply that the basic concepts of organic farming cannot be accepted, and an attempt made to combine organic farming and conventional farming in a practical way. Perhaps the term "organic farming" in its rigid sense can be replaced with a more practical term. Regardless of the terminology, what will have to be sought in Korean agriculture in coming years, is farming systems which are attractive to farmers economically, while satisfactorily meeting the demand of society for agriculture which is friendly

to the environment and efficient in its use of resources. Organic farming may be one approach to this goal. In practical terms, in adopting some of the components of organic farming, priority will be given to:

- Absorption of organic by-products into the agricultural system to minimize the use of chemical fertilizers, build up long-term soil fertility, and contribute to the conservation of the environment.
- Minimizing the use of agricultural chemicals through integrated pest management and the use of biological alternatives; and
- Development of integrated bio-farming technology.

### CONCLUSION

The behavior of organic matter in the soil, and its effect on plants and soil organisms, is intrinsically complex. Organic farming is a very complex type of farming system. Thus, it would not be reasonable to expect that a concise definition of "organic farming" acceptable to all can easily be drawn up. The common notion that "organic farming" is a farming system that does not use chemically synthesized materials seems to be far too simplistic. Farmers following this definition avoid the use of chemical fertilizers and pesticides, but tend to use too much organic manure, as well as commercial biological products of dubious value. As a result, farmers suffer economical losses, the quality of their soil deteriorates, hand weeding imposes a heavy labor demand, and there is sometimes severe damage from diseases and insect pests. In addition, the quality of the produce is sometimes questionable, and occasionally the concentration of nitrates is extremely high. Research and extension services are being strengthened to rectify these problems, and to establish sustainable farming systems suited to different agro-economic settings in different parts of Korea. Some aspects of organic farming are seen as components to be adopted in achieving this goal during the coming years.

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## DISCUSSION

Dr. Roger Blobaum of the World Sustainable Agriculture Association drew the attention of Dr. Hong to the report of the U.S. Department of Agriculture. This had concluded that organic farming is a viable and successful option which should be considered by farmers. He pointed out that more farmers each year in USA are adopting organic agriculture. Dr. Hong explained that conditions in Korea are rather different: Korean farms are very small and it is difficult to use rice fields for other crops in a crop rotation system, especially with Korea's long, cold winters. Population pressure is high, and farmers cannot afford to wait a year while they build up soil nutrients with organic matter and legume crops. Dr. Hong suggested that one approach might be to try and introduce another type of value to organic agriculture. For example, flowers can be used for beauty, and also as a source of honey. If organic agriculture can satisfy a range of values which can be translated into cash income for farmers, it will become more economically viable than it is today in Korea.

Dr. Saleem Ahmed said that he was unsure whether Dr. Hong was basically for or against organic agriculture, but felt that the fact that farmers in Korea are using reduced levels in chemicals was a healthy trend. He pointed out that the Japanese government has recently introduced new guidelines for the use of chemicals in agriculture, and suggested that these might also be of interest to Korea. Dr. Hong replied that he was neither for nor against organic agriculture, but that he was ready to accept it insofar as it is useful for Korean farmers. He felt that many experts are promoting organic agriculture with a great deal of technical "know-how", but with very little "know-why": i.e. the reasons for adopting organic agriculture are often unclear. There has been little scientific testing of organic compared to well-managed conventional agriculture, in terms of e.g. yields, soil productivity and food quality. He suggested that chemical fertilizer can be a valuable resource if properly used, and pointed out that rice yields in Ghana are only 1.1 mt/ha, while in Korea they are 4 mt/ha even if no chemical fertilizer is applied, because of the build-up of plant nutrients in the soil over the years.