Sustainable Farming in Tap Water Area: A Case of Paldang Project in Korea[*]

Kie-Yup Shin[**]

The experience of the Paldang Project in Korea, a sustainable farming practice in tap water source area, is outlined and discussed in terms of objectives, programs, performance, and future directions. The Project is to provide mutual benefits for farmers and consumers with collaboration of both groups. Sustainable farming is implemented by reducing chemical inputs for crop production and applying sawdust fermentation treatment of livestock waste in Paldang tap water source area. Economic incentives, including agricultural loans at favorable rates and market outlets for organic produce, are given to participant farmers. Those financial resources are provided by a joint contribution agreement between National Agricultural Cooperative Federation and Seoul Metropolitan Government. The performance of the Project is realized in terms of more application of sustainable farming that brings about preservation of clean tap water, more supply of safe agricultural products, higher farm income, etc. Efficient marketing system for organic produce remains a major task for further development of the Project.

Keywords: *Sustainable Farming, Low Input Crop Production, Sawdust Fermentation Practice, Tap Water Source Area, Organic Produce Marketing*

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[**] Senior Researcher Task Force Team on Agricultural and Rural Development and National Agricultural Cooperative Federation, Republic of Korea.
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I. Introduction

There has been a growing concern for sustainable agriculture or environmentally friendly agriculture in Korea. From a perspective of consumers, food safety and health concerns motivate to promote sustainable farming practices. Farmer groups are also active in calling for more government supports, technical and financial, for sustainable agriculture. Recently, there seems some progress towards better environment in agricultural sector, government and market, in this country.

Social benefits, if any, from sustainable agriculture can be realized only if some people are willing to pay costs for the benefits. Social costs associated with sustainable agriculture may be allocated among related groups in terms of participation, tax burden, market prices, etc. Anyway, there would be any involvement or commitment of the people through public policy or market mechanism. To make a voluntary and explicit agreement is also a promising way of cooperation between farmers and consumers for social benefits.

This paper is to introduce a case of sustainable agriculture promoted by joint efforts among farmer groups and consumer representatives in Korea. The so-called Paldang Project is described, focusing on its objective, programs, and performances. Current issues are critically identified and discussed based on the results of a comprehensive farmer survey. Future directions of the Project are also suggested in terms of technical, marketing, and policy issues. It should be noted that most of the discussion in this paper is heavily depending on previous studies, especially Yoo and Song (2000).

II. Outline of the Paldang Project

2.1 Background

Farmers in Paldang area have been in trouble with strict restriction on farming and property rights since the area was designated as an area for tap water source protection by the government. Some pioneering farmers have been active in sustainable farming in this area. The motivation of the Project was basically to provide farmers in trouble for assistance form local government who represents the beneficiaries from the public regulation.

The quality of city water has been a public concern for Seoul Metropolitan Government as well as tens of millions of residents in Seoul and neighboring area. Agriculture, including livestock husbandry, in the tap water area has been considered one of the major sources of tap water pollution. There seems a conflict between farmers and city residents.

In February 1995, a proposal to compromise the conflict was made by NACF to Seoul Metropolitan Government. The plan was to promote mutual benefits through cooperation between both sides. The government provides economic compensation for sustainable farming for the farmers, and the environmentally friendly practices then provide environmental benefits for the city residents. Finally, an agreement was made in May 1995 between SMG and NACF that mutual cooperation will be made to foster sustainable farming in Paldang tap water source area. (NACF, 1996)

2.2 Objectives

The Paldang Project is to foster environmentally friendly farming in Paldang tap

water source area. The objectives of the Project are manifold. First, it is to improve quality of city water in favor of tens of millions of residents in Seoul through protecting tap water source area from farm-originated contamination. Second, it is to encourage local farmers to engage in sustainable farming practices with lower environmental burden through providing economic incentives and education programs. Third, it is to ensure environmental benefits for producers in terms of sustainable farming and consumers in terms of quality farm products.

The objectives are basically mutually beneficial to farmers, consumers, and the public as a whole. The public nature of the Project is well understood by the joint partners: Seoul Metropolitan Government and National Agricultural Cooperative Federation. Common understanding provides a basis for common efforts and contributions that are specified in the following programs.

2.3 Programs

The Paldang project is composed of three major programs: education, financing, and marketing programs. The education program is intended to encourage farmers to participate in the project through making them understand the importance and benefits of sustainable farming. Technical information regarding to sustainable is also delivered to farmers attending educational programs.

The NACF has been in charge of conducting the education program in collaboration with specialists from outside. Successful completion of the basic and technical education program is strongly required for farmers who want to take part in the project. Participants are also encouraged to make and join one of cooperative farming groups that pursuing sustainable farming through adopting new technology, purchasing relevant inputs, and marketing their quality products.

Financial supports in terms of low interest loans are given to participant farmers

by agricultural cooperatives. The financial subsidy from the Seoul Metropolitan Government makes it possible for agricultural cooperatives to make loans at favorable conditions such that a maximum of 40 million won (about 30 thousand dollars) is credited to farmers at an interest rate of 5 percent per annum for a period of 7 years with a grace period of 2 years. The difference in market rate and loan rate, amounted 7.5 percent in 1995, are compensated by the financial subsidy from the Seoul Metropolitan Government (SMG). The initial program is agreed to provide a total of 100 billion won (about 77 million dollars) for three years to a total beneficiary of 2,500 farmers. In practice, the loan amounts are a total of 23 billion won (18 million dollars) in 1999, with a half of the loans for livestock farms, showing quite less than the proposal.

Such a financing program played an important role in encouraging farmers to join the Project at least in the beginning stage. Financial incentives also help the farmers invest relevant capital equipment for sustainable farming. It is also noted that the financial costs are paid by taxpayers/residents in Seoul who are beneficiaries for quality city water as well as quality farm products.

The marketing program is considered to be crucial for the success of the Project. The agreements between SMG and NACF specify a common contribution towards market promotion. Special grocery stores are to operate for marketing quality farm products in Seoul area, where store site are provided by SMG and store operation are in charge of NACF. NACF is more committed to provide market outlets for participant farmers through wholesale market, retail market, and direct marketing.

The NACF retail stores specialized for farm products grown in sustainable farming practices are increasing from 11 in 1996 to 52 in 1999, with a growing sale amount from 88 million won (68 thousand dollars) in 1996 to 4.4 billion won (3.4 million dollars) in 1999.

III. Performance of the Paldang Project

This section reports major findings of a field survey on performance and issues of the Paldang Project. The survey was designed and conducted by research specialists of NACF with aid of extension staffs of primary agricultural cooperatives in March 2000 (Yoo and Song, 2000). Two hundred and eighty farmers participating in the project were interviewed that were engaged in different crop growing and livestock husbandry in Paldang tap water source area.

3.1 Farmer Participation

The rate of farmer participation is one of the most important features of the performance of the Project. The overall statistics shows the Project began with 638 farmers in 1995, the first year of the project. Among them, 319 farmers were primarily engaged in raising livestock, while 282 in vegetable growing, 33 in rice farming, and 4 in fruit growing. In 1999, the fifth year of the Project, the participants increased to 1,145 farmers with main occupation of 589 for livestock, 502 for vegetables, 33 for rice, and 21 for fruits. It is noted that new participants came mostly from livestock and vegetable farmers.

A majority of the respondents have reported that they were motivated to join the Project for environmental concerns such as contribution to environment (28 percent) and production of safe agricultural products (32 percent). Economic motivations were also important for the participation including getting favorable loans (21 percent0, expecting better prices for safe and quality products (15 percent), and reducing input costs associated with application for chemical fertilizer and agro-chemicals (4 percent).

The results indicate that participating farmers are well informed of the nature and

importance of sustainable farming as well as the Project. Such a high commitment can be partly explained by their age background. The age distribution of the respondents shows that 64 percent were at their 40s or below and 24 percent at their 50s, indicating that they are much younger than an average farmer is in Korea.

Education programs concerning sustainable farming would be another factor explaining their high commitment. This argument can be supported by the fact that 96 percent of the respondents started their involvement in sustainable farming in the 1990s. It is also noted that 4 percent, though small, were pioneers who began to adopt sustainable farming practices early before the implementation of the Project.

Group farming is an essential component to promote sustainable farming. The participating farmers have been encouraged to form and join cooperative group farming groups pursuing sustainable farming. The survey shows that the rate of participation in farming groups was as high as 66 percent. Among them, 63 percent became members of the groups after joining the Project, while the remaining 37 percent were already involved in the groups before joining the Project.

Another informative aspect was obtained from the survey that 69 percent of the respondents were enrolled members of various associations and organizations regarding sustainable farming. The organizations have been active in providing specific technology as well as in developing market outlets for their members.

3.2 Environmental Benefits

The environmental benefits from sustainable crop farming can be evaluated in terms of reducing the application of chemical fertilizer and agro-chemicals after the implementation of the Project. As for rice farmers surveyed, 60 percent responded that they have reduced agro-chemical application by 30 percent or more and 64 percent reported that they have reduced chemical fertilizer application by 30 percent or more.

It is reported that 17 percent of rice farmers have reduced their application of chemical fertilizer and agro-chemicals by 70 percent or more.

As for vegetable farmers surveyed, 64 percent reported that they reduced agro-chemicals application by 30 percent or more, and 66 percent replied that the application of chemical fertilizer has reduced by 30 percent or more after joining the Project. It is noted that about 30 percent of vegetable farmers have reduced their application of agro-chemicals and chemical fertilizer more than 90 percent.

Most of the respondent crop farmers have also reported that more manual work has been required to maintain good crop as the application of chemical and fertilizers has been made less. As for rice farmers, 66 percent reported that their labor hour has been increased for less chemical application. As for vegetable farmers, 79 percent of the respondents reported any increase in labor hour due to adoption of sustainable farming practices.

As for livestock husbandry, an important feature of sustainable farming is the application of sawdust fermentation practice. The practice is to apply sawdust and enzyme on the floor of livestock house for absorbing animal feces and urine and to make use of the fermented mixture of sawdust and feces-urine as feed and fertilizer. The sawdust fermentation practice has been a strong requirement for those livestock farmers participating in the Paldang Project, since the outflow of animal waste has been considered to cause river water deterioration.

All the livestock farmer respondents reported that they have been applied the sawdust fermentation practice, with 29 percent of them applying it since earlier before their involvement in the Project. They also reported the difficulties associated with sawdust availability and its high price. Livestock farmers have been usually purchasing sawdust from agricultural/forestry cooperatives (61 percent) and sawmills (32 percent). It is notable that most farmers (88 percent) have complained of

economic burden due to high market price of sawdust. The problem of high sawdust price is partly caused by increasing demand for sawdust from livestock farmers adopting the practices. Unstable supply of sawdust is pointed out another difficulty with the practice by 35 percent of relevant respondents. The fermented manure is mostly provided to crop farmers in the neighborhood for free (40 percent) or for an exchange of straw and sawdust (60 percent).

KRSRI (1999) evaluates the overall environmental benefits of the Project through reducing chemical input application and applying sawdust fermentation practices. It reports that, as for a tributary running of the river in Yangpyung County, there has been a drastic improvement of water quality from the fifth grade before the Project to the second grade after the Project.

3.3 Marketing and Farm Income

Ensuring better price for quality farm products grown in environmentally friendly way is a critical factor to encourage farmers to introduce and expand sustainable farming practices that usually entail higher cost and lower yield. A typical problem of asymmetric information on quality arises between farmers and consumers when final consumers are not able to perceive the quality of environmentally friendly grown farm products. In this case, market prices usually are not sufficient to compensate farmers for higher production costs. Special market arrangements can be made for ensuring quality information to consumers, including quality certification scheme, separate market outlet for such quality products, direct marketing to final consumers, etc.

Survey data on marketing outlets of farm products shows that only 56 percent of farmers markets their quality products through special market channels such as retail outlet for organic produce operated by agricultural cooperatives (20 percent), environmentally friendly farmers organizations (15 percent) and consumer cooperatives

(3 percent), other discount stores (6 percent), and direct marketing (12 percent). Meanwhile, the remaining 44 percent of farmers sell their products through ordinary market channels without any premium on quality.

The survey indicates that about 50 percent of participating farmers is selling their products at a price premium on their quality. As for rice, 29 percent of respondents are reporting that more than 20 percent price premium is realized for their quality products. As for vegetables, 32 percent of farmers are enjoying price premium of 20 percent or higher for their quality products. Others are marketing their products at ordinary market prices.

Quality certification is given to environmentally friendly farm products that satisfy the quality standard made by the government agency. However, only 15 percent of the respondent farmers have obtained the quality certification of government standard, while 67 percent farmers are well aware of the system of government quality certification. The major reasons for not obtaining the certification are difficult procedure (29 percent), unhelpful for better marketing (27 percent) and better prices (21 percent).

For 65 percent of total respondents, farm income in 1999 seems to increase compared with those before their joining the Project. Major factors contributing farm income are less input costs for chemical fertilizer and agro-chemicals (34 percent), stable market outlets (26 percent), favorable market prices (20 percent), etc. However, the rate of income increase is not substantial in that 36 percent of total respondents report the income increase of less than 10 percent.

Meanwhile, 21 percent of respondents report any decrease in their farm income after their participation in the Project. The major factors responsible for farm income decrease include higher labor costs especially for weeding (31 percent), lower yield mainly due to technical incompetence (24 percent), unstable marketing outlets (20

percent), etc.

IV. Future Directions for the Project

4.1 Technical Issues

Technology is a basic and central aspect of sustainable farming system. Related to the Paldang Project, several technical issues are identified through the farmer survey. How can we make an ecological farming system really work in Paldang area that connects crop farming to livestock husbandry? How can we resolve the problem of unstable crop yield due to less application of agro-chemicals? These technical issues put any constraints on farmers' economic decision on introduction and expansion of sustainable farming practices on their own farms.

Ecological farming system in the Paldang area is referred to "regional resource circulation system", an organic inter-relationship between crop farming and livestock husbandry. Crop farmers supply rice hulls, sawdust, and woodchip to livestock farms that make use of them in process of fermenting animal waste. Fermentation manures are provided to crop farms that apply the manure to enhance fertility of cropland. A pilot program is initiated by agricultural cooperatives in Paldang area. (Noh, 1999)

A necessary condition for regional resource circulation system is to establish a local equilibrium of demand-supply of resource. Actual constraints come from supply shortage and high price of sawdust and wood chip that are essential for organic livestock husbandry. Government supports are suggested to provide wood materials from planned deforestation of government-owned forest for farmers and agricultural cooperatives in need.

As for crop farmers pursuing sustainable farming, it is required to develop more

technical inputs for integrated pest management such as biological materials for crop protection. Site-specific application of fertilizer together with soil inspection is also needed to expand further though NACF is working for integrated nutrient management programs. Government should spend more money for scientific research for IPM and INM as well as for organizing and supporting expert groups in field works.

4.2 Marketing Issues

A key factor for success of the Paldang Project is how to provide economic incentives for participant farmers to maintain or improve their farm income through sustainable farming. Better prices for quality safe farm products should be ensured in the market where consumers are willing to pay more for those products. Imperfect information problem, however, lies between farmers and consumers. Efficient market system is required to connect buyers to sellers by providing relevant information on quality to consumers.

Several ways to circumvent such information problems have been pursued by farmers, cooperatives, and government. Special grocery stores for quality farm products operated by NACF failed to be major marketing channels mainly because they were not market oriented in terms of location, business strategy, etc. Consumer cooperative stores also did not show good performance in terms of sales volume, though there are high commitment of cooperators and consumer members.

Direct marketing through the internet would be a promising strategy for marketing quality farm products since digital marketing is fast expanding among consumers widespread in Korea. A necessary condition is how to certify the quality of products and creditability of suppliers for cyber customers. Another problem comes from relatively high marketing costs for handling and transporting the products, especially fresh produce, considering the willing-to-pay of the customers.

Modernized discount stores, growing recently, are important channels for marketing quality farm products in large cities. Consumer creditability, market-oriented business, and considerable market share of such marketing institutions are expected to contribute to consumers for easy access to quality farm products at reasonable prices. Formal trade agreement between farmers groups and discount stores may help expand sustainable farming through providing participant farmers for stable farm income and through assuring consumers for availability and creditability of quality products. Hanaro-club, a discount store operated by NACF, also provides a market place especially for farmers groups in the Paldang Project area.

4.3 Policy Issues

In promoting sustainable farming, the government are supposed to play several important roles in supporting scientific research in technical farm inputs and new farming practices, establishing market standards including quality certification, and enhancing awareness of the public including farmers as well as consumers.

Public research institutions are supposed to investigate scientific background for traditional farming practices that are mostly based on organic farming techniques operated locally and crop-specific. There have been some complaints of organic farms that their farming practices are misunderstood and their products are underestimated in the market. Also more applicable techniques and accompanying technical inputs for IPM as well as INM are to develop by the public institutions.

Certification of quality farm products grown in environmentally friendly farming practices is vital for developing stable market demand for such farm products and expanding sustainable farming. Since information is obviously costly, some costs is to given to decrease information gap between farmers and consumers in the marketplace. More efforts and expenditure of the government are required to

establish quality standards and make quality information deliver to consumers.

Further activities for market development should be emphasized to promote the public understanding the importance of sustainable farming and its externalities. Once the people come to understand the real meaning of the sustainable farming, the market force is going to make things go in a right way. Education programs, formal and informal, are to implement for the public including farmers. Generic advertisement for environmentally friendly agriculture and its positive externalities are to strengthen through various media. Public campaigns are also helpful to inform the people of the practical ways for joining the caring groups, local and national.

V. Conclusion

In the beginning, the Paldang Project was initiated by NACF in collaboration with Seoul Metropolitan Government. The nature of the mutual agreement on the Project was basically oriented to social movement or program oriented rather than a market-oriented business contract. During the last 5 years or more, the Project has shown quite a successful performance in terms of farmer participation, environmental benefits, and marketing and farm income.

Several issues are identified for the further development of the Project through a farmer survey. Included are technical issues, market issues, and policy issues. Most issues are related to how the relevant market is able to work by itself through overcoming imperfect information problem. In this regard, Government supports are justified by the nature of externalities especially in the area of technical assistance, quality certification, and market development.

References

Korea Rural Society Research Institute (KRSRI), 1999. Field Study on Project for Fostering Environmentally Friendly Agriculture in Paldang Tap Water Source Area.

National Agricultural Cooperative Federation (NACF), 1996. History of Agricultural Cooperatives in Korea: 1961-1996. NACF.

Noh, E.H., 1999. A New System of Production and Marketing of Environmentally Friendly Agricultural Products. Presented at International Seminar on Environmentally Friendly Agriculture held by NACF.

Yoo, C.K., and H.C. Song, 2000. Present Situation and Development Directions of Project for Fostering Environmentally Friendly Agriculture in Paldang Tap Water Source Area. National Agricultural Cooperative Federation.

自來水水源區的永續農業經營：以韓國 Paldang 永續農業經營計畫爲例*

Kie-Yup Shin**

本文介紹在韓國 Paldang 縣之自來水水源區所施行的一種永續農業經營計畫，文中將以該計畫之目標、計畫內容、執行成果及未來發展方向為討論重點。這是一種提供給農民與消費者，透過雙方之合作達到彼此互利目的之計畫。在 Paldang 縣自來水水源區所施行的永續農業，是以減少農作生產化學要素之投入，而改用以禽畜排泄物與鋸屑發酵而成之有機物的經營方式。此一計畫之推行是以農業低利貸款及開創有機產品之行銷通路，做為鼓勵農民參與的經濟誘因。而此一誘因工具所需之財源則來自 National Agricultural Cooperative Federation (NACF)及 Seoul Metropolitan Government 雙方協議下之捐獻。此一計畫執行之成效具體表現於乾淨自來水水源之維護、更多有機農產品之供應與更高之農民所得等多方面。此一計畫未來發展的主要工作重點，是在尋找更有效率的有機農產品之行銷系統。

關鍵詞：永續農業、低投入農作生產、鋸屑發酵經營、自來水水源區、有機產品行銷

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** Senior Researcher Task Force Team on Agricultural and Rural Development and National Agricultural Cooperative Federation Republic of Korea.