

Kyusei Nature Farming in Japan

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Abstract

The nature farming movement in Japan has gained momentum in recent years among farmers, consumers, and the governmental officials. The search for more natural, nonchemical means to improve soil tilth and fertility, and to control pests has led to the use of effective microorganisms (EM). Trials with EM have now been conducted for a wide range of vegetable crops, legumes, fruits, and field crops. Results have been promising in terms of high yields, suppression of weeds, and reduced need for agrichemicals. Recommendations for the successful use of EM are given.

On this occasion of the First International Conference on Kyusei Nature Farming, I would like to describe the history of Kyusei Nature Farming in Japan.

The organic agriculture and nature farming movements in Japan began to develop in the early 1970s. They were motivated by the publication of a book entitled *Fukugoh Osen* (Complex Pollution), written by Sawako Ariyoshi in 1975. The author was inspired by the shocking report, *Silent Spring*, written by Rachel Carson in 1962. Ariyoshi's book reports the results of her investigation of environmental pollution in Japan.

Currently, the movements and organizations that advocate organic agriculture and nature farming are closely related to consumer movements for safe and nutritious food. The number of Japanese farmers participating in such movements is about 50,000, and the sizes of their organizations range from a few farmers to tens of thousands of farmers. These movements have gained the support of the urban sector of society.

The Japanese Ministry of Agriculture, Forestry and Fisheries also recognizes the importance of the movements of organic agriculture, and established the Office of Organic Agriculture in 1989. This was accomplished through the activities of the Japan Organic Agriculture Study Group and the Association of Dietmen for Studying Organic Agriculture. There were 96 Dietmen that supported this action.

This development resulted in the expansion of the number of farmers in the organic agriculture movement in Japan to about one percent of the total farmers. Most of them, however, are small-scale farmers.

Foreseeing this situation in 1935, Mokichi Okada presented the ideals of Kyusei Nature Farming, which have contributed significantly to the organic agriculture and nature farming movements in Japan today. Kyusei Nature Farming advocates a production system which does not disrupt the natural ecosystem and seeks to achieve the production of healthy agricultural products without the use of chemical fertilizers and pesticides. The social situation at the time of its advocacy, however, was not mature enough to accept Kyusei Nature Farming. Consequently, it was practiced by only a few farmers who enthusiastically embraced the philosophy of Kyusei Nature Farming and its principles.

On the other hand, the decline in soil productivity and crop yields from the degradation of farmland, environmental pollution from agrichemicals, and the hazards to human and animal health from modern agriculture, have become important social problems.

In this regard, Kyusei Nature Farming is now attracting the attention of many people since it utilizes the natural ecosystem while conserving and protecting the environment. Presently in Japan, there are about 1,500 farmers practicing Kyusei Nature Farming in paddies, fields, and orchards. However, further research is needed to determine the cost, productivity, labor requirements, and overall profitability of Kyusei Nature Farming. This information must be known before there is widespread acceptance of Kyusei Nature Farming by conventional farmers.

Since the current technique of Kyusei Nature Farming concentrates on the utilization of compost, Kyusei Nature Farming has not yet satisfied all of the requirements for agriculture of the 21st century, that is:

- 1) High productivity,
- 2) Labor saving,
- 3) Energy saving,
- 4) Safety, and
- 5) Marketability.

In 1983, we started cultivation experiments using a new technique which follows the original philosophy of Kyusei Nature Farming. The conventional technique of Kyusei Nature Farming satisfies only two of the requirements, that is, energy saving and safety. Kyusei Nature Farming which adopts the technique of using effective microorganisms (EM), developed by Dr. Teruo Higa of the University of the Ryukyus, has good prospects of satisfying all five requirements.

The experimental cultivation for testing the effect of EM was performed at the Ishigaki Farm in Okinawa Prefecture for three years starting in 1983. The results of this study are shown in Table 1. The highest yield of peanuts and carrots were obtained from nature farming using EM, followed by conventional agriculture, and conventional nature farming. The effect of EM was dramatic. EM was also very effective on sugarcane, pineapple, potatoes, Daikon radish, cucumber, and leafy vegetables.

After these basic experiments, we began nationwide cultivation trials in 1986. Since Japan has an extreme range of climatic zones, from subarctic to subtropical, trial cultivations could be conducted at locations which are representative of the world's principal agroclimatic zones.

In the subarctic zone, EM was found to be effective in large-scale production of wheat, potatoes, soybeans, adzuki beans, onions, and carrots.

In the temperate zone, trial cultivation was performed in paddies, fields, and orchards. With EM, it is now possible to grow tomatoes, cucumbers, and eggplants in greenhouses, which was considered to be very difficult before. Furthermore, with EM we succeeded in growing fruits such as apples, Japanese pears, cherries, grapes, and especially European grapes without pesticides. This was virtually impossible before.

The results in the subtropical zone are those reported for the Ishigaki Farm in Okinawa (Table 1).

Table 1. Yield of Peanuts and Carrots Grown in Three Different Farming Systems.

Crop	Conventional Nature Farming	Conventional Agriculture	Nature Farming Using EM
	kg ha ⁻¹		
Peanut	500	2,000	3,500
Carrot	10,000	25,000	28,000

Table 2. Outline of the Basic Experiments and Trial Cultivation Using EM.

Type of Study	Year	Area	Farmers	Crops
		ha	No.	No.
Basic EM Experiments	1983-85	5	1	15
Trial Cultivations	1986	30	200	50
	1987	60	470	80
	1988	150	1,030	120

As shown in Table 2, the area of cultivation has been largely increased, and EM has proved to be effective for many crops. Cultivation using EM is now in the transition stage from trial cultivation to practical cultivation. Considerable progress is expected this year from trial cultivations using EM. From these results of nationwide trial cultivations using EM, the following conclusions can be made about the five requirements for a more sustainable agriculture in the future:

- 1) **High Productivity.** High productivity is restored and maintained by the reduction of disease and insect pests in soils and crops. Direct effects due to the increase of nitrogen-fixing bacteria and VA mycorrhizal fungi has also been observed. This effect comes from EM 2 and EM 3.

- 2) **Labor Saving.** There are many examples in the trials where the time required for weeding in paddies was absolutely zero. This was considered to be impossible before. The large reduction of weeding hours has also been observed in fields and orchards. This is possible because soil aggregation and soil structure are enhanced by the use of EM, and soil tilth is considerably improved. The suppression of weeds in paddies is facilitated by EM 4, and in fields and orchards by EM 2 and EM 3. There are also cases in which the work of cultivation management was largely reduced because EM made nonplowing cultivation possible.
- 3) **Energy Saving.** This effect is obvious since Kyusei Nature Farming does not use chemical fertilizers and pesticides and, therefore, fossil energy required to synthesize those products is unnecessary.
- 4) **Safety.** This is also obvious because no chemical fertilizers or pesticides are used. Thus, the safety of the method and the crops it produces is ensured.
- 5) **Marketability.** The use of EM has improved the quality of crops and has overcome the limitations of conventional Kyusei Nature Farming such as pest-damaged and irregular crops.

This is the present state of Kyusei Nature Farming in Japan. In summary, I would like to make a few points which should be kept in mind when using EM.

The first is that EM is a living culture and, thus, fundamentally different from chemical fertilizers and other agricultural chemicals. Therefore, it is necessary to establish a soil environment which allows the survival, growth, and reproduction of the microorganisms in the EM cultures. In particular:

- 1) The soil pH must be adjusted. Since most soils in Japan are acid, the pH of paddies is adjusted to 6.0 and that of fields and orchards is adjusted to 6.5.
- 2) Soil must be kept moist. This can be done by using compost, grass mulch, and drip irrigation.
- 3) Organic materials must be added to soil if necessary. A humus content of about 3 percent is recommended.
- 4) EM must be diluted before application. In ordinary application, EM 2 is diluted by 1 : 1000, and EM 3 by 1 : 1000 > to 1 : 2000. EM 4 should not be sprayed over leaves. If EM 4 is used for the treatment of soil, it should be diluted by 1 : 1000.

The second point is that there is no uniform instruction manual for the use of EM as there is for chemical fertilizers and pesticides. It is said that the only instruction manual for EM is that there is no manual. This is because the agroecosystems for crop production are different, and EM must be used in a way that is most suitable for each environment. Therefore, it is necessary to characterize the environment through careful observation and then establish the EM treatment. This approach is fundamental to agriculture. We believe that to strengthen the soil complex is to vitalize the earth and its harvest. The principle of Kyusei Nature Farming is to vitalize the earth, and its goal is to attain the health of mankind.