Use of Effective Microorganisms in Brazil

S. Kinjo and S. K. Homma
Center for Development of Kyusei Nature Farming, Mokichi Okoda Foundation, lpedna, SP, Brazil

Abstract.
Agriculture in Brazil faces severe problems as a result of intensive use of chemical fertilizers and pesticides without consideration for adverse effects on soil productivity, and related ecological factors. Brazil, as well as many other countries, is looking for alternatives. This situation has encouraged the growth of Kyusei Nature Farming, and this report presents the results of Kyusei Nature Farming techniques with Effective Microorganisms (EM) on a variety of vegetable crops, tree crops, and flowers in several geographical regions of Brazil. Laboratory and field studies have been conducted to support the needs of both agricultural and environmental concerns, such as treatment of industrial residues, sewage and malodors, and disease problems associated with animal husbandry. Therefore, Kyusei Nature Farming with EM works toward the development of an agricultural system that can restore the original balance of nature and protect the environment.

Introduction

Kyusei Nature Farming was introduced in 1935 by Mokichi Okada, a Japanese naturalist and philosopher who advocated the "living soil" as the basis for healthy crops and healthy people. At that time, Okada foresaw the risks of a farming method that relies on the use of chemical fertilizers and pesticides. By stressing the power of nature and the need to learn from it, he established the concept and practice of Kyusei Nature Farming which must satisfy the following five requirements:
It must produce safe and nutritious food to enhance human health.
It must be economically and spiritually beneficial to both farmers and consumers.
It must be sustainable and easily practiced.
It must conform to nature and protect the environment.
It must produce enough food for an increasing world population.
However, in order to satisfy these requirements, Okada specified the following conditions for Kyusei Nature Farming. It must be able:
to turn soil into a nutrient storehouse;
to enhance the soil to produce more crops as more consecutive plantings are made;
to prevent soil pollution in order to allow the power of soil to be fully expressed, i.e., to suppress diseases and insects.
Based on Okada's philosophy, experiments conducted over the past 50 years have substantiated the concept of Kyusei Nature Farming. An added dimension to Kyusei Nature Farming is the concept of Effective Microorganisms (EM) developed by Professor Teruo Higa at the University of the Ryukyus, Okinawa, Japan. EM consists of mixed cultures of beneficial microorganisms that have been used successfully as soil and plant inoculants to improve soil quality and, in turn, to enhance the growth, yield and health of crops.

The Evolution of Nature Farming in Brazil

Brazil occupies nearly one-half the continent of South America and comprises an area of more than 8.5 million km^2. In 1991, it had a population of 146 million people. The national economy has an agro-industrial base; almost 60 percent of the Gross Domestic Product (GDP) is derived from agriculture or related activities. The modernization of agriculture in Brazil, as in other countries, was achieved by increased use of machinery and agrichemicals including fertilizers, pesticides, hormones, and antibiotics. The often indiscriminate use of these materials to increase the production of cash crops has led to extensive soil erosion and loss of productivity, environmental pollution, and economic instability in the agricultural sector. Despite the progressive increase in chemical inputs, crop yields steadily declined because of the degradation of soil quality.
Within this context, nature farming began in Brazil in 1979 on a farm at Atibaia (100 km from Sao

Paulo). The farm occupies 17 ha of which 4 ha have been cultivated for the production of vegetables such as carrot, escarole, lettuce, cucumber and radish; fruits (tangerines); flowers (azalea and strelitzia); and branches for lkebana flower arrangements. Also, poultry, pigs and fish are produced. The Atibaia farm is managed by the Mokichi Okada Foundation to demonstrate the operation and management of a small-scale model farm, which also serves as a training and extension center.

Center for Development of Kyusei Nature Farming

The Center for Development of Kyusei Nature Farming was founded in 1990 at lpetina, which is 180 km from Sao Paulo. The farm has 31 ha of which 20 ha are already under cultivation. Crops produced include lettuce, carrot, broccoli, cabbage, tomato, pepper, bean, onion, squash, eggplant, Japanese cucumber and gherkin cucumber as well as cereals (rice and wheat), and fruits (lemon, orange, mango, acerole, litchi). Poultry is also produced. The purpose of the lpetina farm is to provide a model for small-scale farmers as well as a research center on EM technology, a training center, a bokashi factory, and an extension center. It will also conduct research on effects of EM on livestock and the environment, and will serve as an information exchange center for universities and non-governmental organizations (NGO's).

In 1990, Atibaia also became a Kyusei Nature Farming Information Center. Therefore, Atibaia and lpetina can be visited by agronomists, technicians, farmers and others who are interested in the concept and principles of nature farming in general. Because of the agricultural situation in Brazil as described earlier, Kyusei Nature Farming has generated considerable interest throughout the agricultural community including farmers, universities, government agencies, and the private sector.

Kyusei Nature Farming and EM Technology

Kyusei Nature Farming in conjunction with EM technology is now practiced by some 600 farmers in Brazil. Most of these farmers are located in the southeastern region because that is the area where the concept of Kyusei Nature Farming and the use of EM technology was first introduced. Also, EM has been used extensively on vegetable crops and the southeast region is the primary producer of vegetable crops. Fruit crops and flowers rank second and third in the number of farms using EM technology. Some farmers have applied EM to cereals and pastures, and to poultry, swine, and aquaculture production. Effective microorganisms have also been used in the treatment of wastewater, sewage, and effluents. The data show rather widespread application of EM in different agroclimatic zones and for a wide range of different crops throughout the country. Industries such as oil refineries, paper mills, and tanneries have used EM successfully for treating waste sludges and effluents to make them safe and beneficial for recycling on land; EM transforms the organic matter in these waste materials into useful nutrients for plants. The use of EM to solve environmental problems has been extensively researched because of the difficulty in finding safe and beneficial solutions.

The diversity of EM users is apparent based on commercial and non-commercial applications. In vegetable production, a large number of non-commercial producers are using EM; many of them are interested in small plantings for their own consumption. Farming for commercial purposes has developed in other areas. In the flower growing sector, many non-commercial users cultivate ornamental plants in gardens.

The use of EM on pastures has not received adequate attention. As with human use of crop plants for food, productive and healthy cattle depend on a healthy environment and feedstuffs. The intensive use of agrichemicals has endangered cattle production because of the costs, potential adverse effects on human and animal health, and environmental pollution. The use of EM improves animal husbandry conditions and accelerates the decomposition of malodorous organic wastes into beneficial materials, i.e., soil conditioners and biofertilizers. Thus, EM facilitates the recycling of animal wastes for soil improvement and plant growth without polluting the environment. Therefore, the prospects for integrating pasture and livestock production while providing environmental

safeguards are very promising.

Those farmers who are interested in nature farming cultivate a wide range of farm sizes, i.e., both small-scale and large-scale farms. The smaller farms of 10 ha or less are considered to be non-commercial farms while farms of more than 10 ha are commercial ones. The Second International Kyusei Nature Farming Conference that was held at Luiz de Queiroz College of Agriculture, University of Sao Paulo, in Piracicaba, Brazil brought together many scientists, administrators, farmers, and students who expressed strong interests in alternative and sustainable agriculture. This conference did much to expand the concept of Kyusei Nature Farming and the potential use of EM technology in Brazil and throughout Latin America and South America. A strong environmental movement has helped to extend this knowledge throughout the region.

Another factor that has contributed to the expansion of interest in Kyusei Nature Farming and EM technology in Brazil and in the surrounding region has been the increased number of personnel at the Mokichi Okada Foundation. Since most conventional farmers are not familiar with the concept of Kyusei Nature Farming, it has been necessary to reeducate farmers in this new methodology. Besides the Foundation agronomists who provide technical advice to the farmers, researchers on EM application, field workers, and administrative employees are also essential. Moreover, because Brazil is a very large country with large variations in climatic and agroecological conditions, it has been necessary to establish regional centers for demonstrating the merits of Kyusei Nature Farming (i.e., the concept and methodology) to farmers, and for training technicians and farmers in the application of EM technology.

The use of EM is extremely broad and the exact application strategy will depend on a specific farming system, climatic and agroecological conditions, and the farmer's indigenous knowledge and practices. In Brazil, EM has been used for vegetables, fruits, flowers, cereals, pastures, and reforestation; and also for livestock such as cattle, poultry, pigs, earth-worms, fish and shrimp. It has also been used for the treatment of municipal, agricultural, and industrial organic wastes including sewage sludges and effluents, tannery wastes, oil processing wastes, and citrus processing wastes.

Summary

Most farmers who request technical assistance from the Kyusei Nature Farming Center are practicing conventional agriculture. They are facing a multitude of problems including the loss of soil productivity from erosion, devastating crop diseases and insect infestations, environmental pollution, and impaired health of family and farm workers. Many of these problems are undoubtedly related to the indiscriminate use of agrichemicals. Kyusei Nature Farming can help to solve these problems by making people aware of nature and by teaching them to observe and learn from nature in order to satisfy the five requirements advocated by Mokichi Okada.

references

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