Nature Farming in the Philippines

T. C. Mendoza
University of the Philippines, Los Banos, Philippines

Abstract

For almost three decades, farmers in the Philippines have been using chemical fertilizers, pesticides and growth regulators in their crop production strategies. Despite the high cost of these inputs, and the farmers' awareness that they can adversely affect soil fertility, food quality, human and animal health, and environmental quality, they are used extensively because there are few alternatives that would be considered practical and feasible. One reason for this is that university-based research has strongly promoted the use of agricultural chemicals as the best means of achieving the highest possible crop yields. The predominant question then is how can the farmers shift from a chemical-intensive agriculture to one that is based on the utilization of natural systems, and still maintain their economic Viability. It is encouraging that there are some efforts now underway by university researchers, the Philippine government, and the private sector to develop nature farming as an alternative to chemical-based agriculture.

The government, in cooperation with non-government agencies, needs to set forth certain policy initiatives that would promote the necessary research for the development of productive, profitable, and sustainable natural farming systems, and to ensure that such knowledge is transferred effectively to the farmers.

Introduction

For the last 20 to 30 years, farmers in the Philippines have been practicing a chemical-based agricultural production strategy. The detrimental effects from the use of agricultural chemicals (fertilizer, pesticides, growth regulators, growth hormones, and antibiotics) on the farmer, the farm, the wealth of the nation, the environment, and future generations have been well documented and discussed (Aspiras, 1987; Medina and Ridao, 1987; Onate, 1989; Loevinsohn et al., 1983).

The crucial issue or problem that requires firm resolve is "how do we shift from chemical-based agriculture to one which is sustainable and nature-based?"

In cases where the soil is very acidic and the soil fertility is low, the pest population is extremely complex. Under these conditions, there is a resurgence of new pests, evolution of new biotypes and physiologic races. A sudden shift or withdrawal in the use of fertilizers and pesticides may cause drastic yield reductions. Field trials show that yields may be reduced by as much as 50 to 60 percent (FSSRI Annual Report, 1987). Such yield reductions are obviously unacceptable to farmers, to society, and to the nation as a whole. Yield reductions may mean massive food shortages and incalcuable or unimaginable consequences. These apprehensions or issues raised against a nature farming approach may not be real in practice.

The fear of yield decline could be avoided. This paper presents the results of a university-based research initiative on nature farming, and a case study of a farmer-initiated nature farming system, including a discussion of its implications and some policy imperatives.

University-Based Research on Nature Farming

University-based research is still mostly classified as mainstream research and characterized as being high yield-oriented. This necessitates the use of high yielding varieties, nourished adequately with chemical fertilizers, and protected with an array of pesticides. The capital scarcity of farmers, the risks involved in farming, and the increasing level of environmental pollution are posing serious questions on whether the current mainstream research can be sustained. Certainly the objective of supplying the necessary food and fiber required by our population can be achieved. But at what cost?

In view of these developments, efforts are now underway to evaluate nature farming as an alternative. Mainly, the research being conducted is focused on the input side of production. This research is directed toward minimizing or reducing the input costs of production. This is referred to as Minimum Input Farming (MIF). The objectives of the research are twofold: to determine how best to minimize the use of chemical fertilizers and pesticides. The following research is directed toward minimizing the use of chemical fertilizers:

1) Use of rice straw, corn stover, and sugarcane trash as mulch and fertilizer;
2) Green manuring with azolla and sesbania for lowlands, and mungbean for the uplands;
3) Use of poultry, hog, and cattle/carabao manure;
4) *Rhizobium* inoculation of legumes (soybean, mungbean, peanut);
5) *Azospirillum* inoculation of crops belonging to the grass family (sugarcane, corn, sorghum, napier);
6) Crop rotation schemes involving legumes as the rotational crop; and
7) Intercropping and cover-cropping between nonlegume and legume crops, e.g.,
   a) sugarcane + mungbean, soybean, or peanut;
   b) corn + mungbean, soybean, or peanut;
   c) coconut + winged bean or kudzu.

Addressing the objective of minimizing the use of pesticides, the following research is being undertaken:

1) Use of botanical pesticides. Specific research being conducted includes: the identification and inventory of plants that have pesticidal properties; the identification of mode of action (repellant effect, toxicity); and the extraction procedure, preparation and method of application.
2) Application of the concept/practices of integrated pest management (IPM). Specific research includes: establishing critical threshold for various pests in different crops; and monitoring farmers acceptance of IPM.
3) Use of biological control agents or natural enemies. This area of pest management has not been thoroughly studied in the Philippines. Only *Bacillus thuringensis* and *Trichograma*, which are known worldwide, have been investigated; other species remain to be found.

These university-based research efforts have similar characteristics. They are conducted by individual researchers representing their own discipline, bias, or training. In addition, they are conducted on a project-to-project basis, as their duration is coterminus with the project duration.

There are negative implications for the research. There is no integration into actual farming systems. Rarely are farmers involved in the research process. They are short-term, and data obtained are generally indicative measures. There is no long-term monitoring of effects.

Case Study of a Farmer-Initiated Nature Farming System

Starting in 1980, Mr. Lorenzo Jose* began to shift his farming practices from chemical-based to purely natural farming methods. Neighboring farmers, including his family, thought then that Ka Toti (as he is fondly called) was crazy. Nobody believed that he could shift a conventional, chemical-based farming system to a system of non-chemical, natural/organic farming. First, the soil was unproductive and infertile due to 15 years of intensive rice production. Second, there was a heavy infestation of weeds and other plant pests that had been devastating to crop growth and yield. Also, it was thought that if he did not spray, all the pests in the area would migrate to his farm since all of his neighbors applied pesticides regularly. It was hypothesized that this would accentuate the pest infestations to even more devastating proportions.

Amidst pressures and fears, Ka Toti still pursued the idea of changing his farming method. During the first year of transition, his crop yield was reduced from 80 to 120 cavans ha^{-1} with chemical inputs, to as low as 30 cavans ha^{-1} without chemical fertilizers and pesticides**. For a man who relies solely on farming for his livelihood (although his wife is a government employee) and supports his children in college, this yield decline was most discouraging. This drastic yield decline

---

* Mr. Lorenzo Jose's farm is at Solib, Floridablanca, Pampanga, Philippines. It is at the Central Plain of Luzon Island, 120 km north of Manila.

**1 cavan = 50 kg

sparked considerable doubt and misunderstanding in his family. However, as time progressed, crop yields gradually increased. Five years later, he was getting 2.3 Mg ha^{-1} to 5 Mg ha^{-1} of rice in his best yielding paddy. At present (1989), he obtains an average yield of 3.5 Mg ha^{-1} and he is getting as high as 6.0 Mg ha^{-1} of rice in his best yielding paddy.

What are the features of Mr. Jose's farm? Ka Toti's farm is essentially a landscape mosaic or a diversified farm. The 6.0 ha farm is subdivided into the following parcels:

1) A 3.0 ha pasture area where he maintains 5 cows, I bull, and 6 calves for a total of 12 head of cattle. These ruminants forage in the pasture area and they are not fed with any concentrate or salt. They are just provided with drinking water. The pasture area is planted with acacia trees that provide protection for the animals during the hot summer.
2) About 0.5 ha is planted to ipil-ipil (*Leucaena leucocephala*). The ipil-ipil trees are cut every two years for fuelwood. The fuelwood is sold, which provides cash for purchasing fuel to run the irrigation pump for the rice paddy. Regrowth of ipil-ipil occurs rapidly.
3) About 0.8 ha is planted to fruit trees dominated by mangoes. This area, includes the home lot and a small pond for fish and ducks.
4) The remaining area of 1.8 ha is devoted to intensive rice production and is monocropped throughout the year. This area is subdivided into 52 paddy lots for weekly planting. Each lot is planted to rice at least three times a year.

Such diversity provides the basis of stability and productivity in Mr. Jose's farm. He has structured his farming system for maximum complementarity and integration of enterprises on a whole farm basis, The 3.0 ha pasture area serves as the biofertilizer factory for his intensive rice paddy production. The cattle dung is collected and spread in the rice paddy. To facilitate dung collection, the cattle are tethered at a certain place during the night. Hence, the biomass (grasses and legumes) that the cattle consume is converted into valuable meat for the family's needs and into organic fertilizer for the rice paddy. The wooded area (about 1.3 ha) which is planted to ipil-ipil and fruit trees (mango is the dominant fruit tree) serves as a buffer zone, Weeds in this area are allowed to grow profusely including the viny weeds that tend to cover the mango canopies. This area serves as a wildlife or bird sanctuary, a habitat for beneficial insects, and additional pasture space. The fruit trees provide food for the family and supplemental income during a good fruiting year.

The remaining 1.8 ha devoted to intensive rice cultivation derives benefits from the noncultivated area. The 3.0 ha pasture provides manure that replenishes the nutrients removed through rice production. The other potential benefits depend on a favorable microclimate for the 1.8 ha rice paddy.

The diversity and integration of the farm's enterprises may not fully explain the success of Ka Toti in his rice culture. His rice cultural practices are fined tuned to nature farming from seeding to harvesting. A description follows.

Seedling Preparation

Enough seeds to plant a given paddy of about 300 to 400 m^2 are germinated in a plate. The seedlings are transplanted 8 to 10 days after seeding.

Spacing and Row

Orientation Seedlings are transplanted into rows 40 cm apart, with 5 cm between hills and at one seedling per hill. Rows are oriented east to west for maximum light penetration into the canopies.

Weed and Irrigation Management

The paddy is saturated with water after transplanting. Sometime later, the paddy is drained so that the seedling will be sturdier and more resistant to pests. Still later, the paddy is again flooded. This alternate wetting and drying, from a chemical-based rice farming viewpoint, is not recommended because it can accelerate the volatilization loss of applied N fertilizer.

Harvesting, Spreading and Incorporating Straw

At harvest, rice stalks are cut close to the ground. Immediately, the harvested palay are threshed using a manually pedalled thresher. Rice straw is then spread evenly in the same paddy where rice was harvested. The paddy is then irrigated to moisten the straw. Two weeks later, plowing is done with a carabao. Depending on the soil conditions and fertility, *Sesbania* seeds are sown by broadcasting. One week later, the same paddy is harrowed and prepared for planting.

The cultural practices cited here are interrelated and provide a basis of explanation for his success in following a nonchemical nature farming approach. Other practices also contribute to Mr. Jose's success.

First, the early transplanting of seedlings on a seed-to-hill basis facilitates the unhampered root development-a requirement in growing a healthy plant to better resist pest infestation.

Second, the judicious use of water effectively controls the weeds but not enough to weaken the plant with too much submergence. The practice of maintaining just enough moisture in the paddy field allows spontaneous biological nitrogen fixation (SBNF) through living organisms. This is enhanced by the availability of organic carbon from the rice straw incorporated after every harvest, and the cattle dung applied (Patriquin et al., 1986).

Third, the large row spacing allows maximum light penetration even up to harvest time. The availability of light allows SBNF in paddy fields which reportedly can fix as much as 30 to 40 kg N ha^{-1} (Rice and Soil, IRRI).

Therefore, the development of healthy, sturdy, and well-rooted rice plants is the result of early transplanted seedlings, judicious use of water, and a planting pattern that allows light to penetrate below the plant canopy. Additional benefits derive from these practices. Rice plants can resist more insect infestation because they are healthy and growing vigorously. Also, there is no imbalance in available plant nutrients and, thus, no nutritional stress in the seedlings. Such stress factors impacting the plant would tend to attract insects and diseases. Another benefit is a unique microclimate, resulting from the large row spacing and increased light transmission, that is not conducive to pest population buildup.

Finally, with time, the nonuse of pesticides has paid off. The population ratio between beneficial to harmful insects, which is now 60:40, has shifted toward the beneficial ones (Gapud, 1989 unpublished report).

Discussion and Implications of Nature Farming Systems in the Philippines

Transforming the practices of farmers, who are dependent on the use of synthetic chemical fertilizers and pesticides is not a simple, physical transformation. Farmers' awareness of the high cost of fertilizers and pesticides, the degradation of their soils, and the decline in their quality of life, has not provided sufficient motivation to shift from chemical-based farming to natural/organic farming practices.

Mr. Lorenzo Jose is not a typical Philippine farmer. How many are there like Mr. Lorenzo Jose? We do not know exactly, but they are still few in numbers.

The shift from chemical agriculture to nature farming systems requires a change in the farmer's attitude and philosophy of life. It requires changes in his life style, consumption pattern, and value orientation. But it will take more than this. The vision that "farming is liberation" should be a guiding principle. He who controls the farm inputs controls the farming operation and, thus, controls the resources and enjoys the material gains. This is called value orientation. What do farmers value more? Freedom or food? Freedom may include one's ability to produce adequate food.

Would this require violent or radical change? There is no correlation between the liberation movement launched by peasants and natural farming. The socialist north similarly pursued chemical agriculture as the basis of their food production strategy in the same way as did the capitalist north (Khor Kok Peng, 1989). The cultural revolution in China is an exception, because China to begin with had long practiced nutrient cycling from organic materials (FAO, 1977). When they declared a closed door policy, there was a need to develop a more efficient nutrient cycling process (crop-animal-human-fish-crop). Hence, the pronouncement "turn waste into useful products" was a necessary survival strategy (King and Cleveland, 1980). Furthermore, during that time, the Chinese did not have the technology to manufacture fertilizers and pesticides. At present, however, they are using large quantities of chemical fertilizers and pesticides, especially for their export crops.

What about university-based research? At present, the university-based research establishment has been slow to respond to the needs of farmers who would want to change from chemical-intensive farming to organic/natural farming. The reasons are obvious:

1) The training of researchers is still primarily chemical-oriented. Research on nature farming is still believed to be backward or traditional. Their training and doubts about natural farming as a viable alternative to chemical agriculture inhibit them from pursuing a scope of research on natural farming systems, other than the piecemeal and cost-reducing technologies cited earlier.
2) Funding for university-based research generally favors research with high impact and with easily measurable results in the short-term. Nature farming research provides positive effects over the long-term rather than in the short-term.

However, there are now initiatives by some researchers and faculty members to pursue nature farming research. Small grants are being obtained from private donors. In the Philippines, there are presently several nongovernment organizations (NGO's) that are working at the grassroots level. The realities of farming in the uplands where they normally operate, that is, the resource-scarcity of the farmers and the remoteness of these locations, are major constraints to intensive crop production. Most of these NGO's emphasize natural farming systems and the use of traditional methods for their assistance projects.

What about government-supported food production programs? It is logical for any government to have a centerpiece program directed toward achieving food self-sufficiency or an adequate supply of food and other basic staples for the people. In a Third World setting, food is a political issue since it can often determine whether a government succeeds or fails (Perlas, 1989). This makes conservation goals in nature farming politically unwise. Program planning and implementation emphasize immediate impact as the overriding criteria. Activities that yield results in the long term get less priority (Mendoza, 1989). Chemicals (fertilizer and pesticides) and genetically uniform high-yielding cultivars provide immediate increases in production. Incentives and support services are designed and packaged for extension and delivery to the farmers. As an incentive to farmers who will join the government in this massive food production program, soft loans, crop insurance, marketing, and technical assistance are generously provided (Department of Agriculture, 1989).

In the Philippines, however, there is some positive attention for nature farming practices, although nature farming is not part of the government's food production strategy. The Office of the Undersecretary for Special Concerns emphasizes natural farming practices for their projects in tribal and upland farming communities.

Some Policy Imperatives for Nature Farming

1) Research efforts must be directed toward the appropriate approaches and strategies in various agroecosystems. There are existing technologies and considerable information about nature farming; however, there is a need for fine tuning in accordance with the unique and varied conditions of a given farm. A definite budget for nature farming research and development must be allocated. Similarly, extension services must be strengthened and redirected in support of nature farming systems.
2) A percentage of the tax gain from the sale of fertilizers and pesticides should be allocated for research and development of nature farming systems and practices to ensure a more sustainable agriculture, and to facilitate the transitional process from chemical-based agriculture to natural farming.
3) A media campaign is essential. Agrichemical promotion schemes should emphasize that "pesticides are poison." They are hazardous to health and they can pollute and degrade the environment.
4) A public awareness campaign regarding the potential adverse effects of fertilizers and pesticides, in addition to their yield-enhancing qualities, should be undertaken. Similarly, the benefits of organic waste recycling should be given equal time and space in all types of media.

5) Nature farming requires institutional efforts that will help reorient the thinking and values of the population. First, this should start in the family, the basic unit of society, by instilling practices on proper waste disposal (i.e., wastes should be separated into degradable and nondegradable fractions to facilitate recycling programs).
6) Family enterprises such as backyard gardening should be emphasized and supported with extension-type bulletins. Educational institutions at all levels should incorporate topics and courses on organic waste recycling, home gardening, integrated production systems, biomass agriculture, and nature farming.
7) A law or executive order is urgently needed to ban the practice of burning crop residues. At present, rice farmers are burning their rice straw to facilitate land preparation, and to destroy insects, weeds and diseases. A rice field yielding 80 cavans ha^{-1} usually yields 4 Mg of straw. The equivalent nitrogen fertilizer lost from burning straw at this yield level is equivalent to four bags of urea (Mendoza, 1989).
8) A comprehensive law on nutrient cycling (farm, household, municipal, and industrial/factory wastes) and waste disposal must be enacted. Such energy and nutrient resources should be properly recycled to sustain our present and future generations.
9) An all-embracing land use policy, with the objective of assuring the future population of adequate land, forest, and water resources, must be formulated and implemented. The rapid conversion of prime agricultural 1ands to urban development and industrial sites is highly visible right now.
10) Nature farming is generally based on the principle of biological diversity. This biological principle can be translated into tangible benefits by mandating that each barangay, town, province, and region of the country establish woodlands and plant trees for fuel, construction materials, and food.
11) The Philippines ranks 13th among the most highly populated countries. With a population growth rate of 2.4 percent, it is impossible for basic services to keep pace. Because of intense population pressure and inadequate employment opportunities, cultivation of marginal upland areas with slopes of more than 18 percent has become a widespread practice. This has resulted in extensive degradation of the land resource base by erosion. Hence, a comprehensive family planning program is urgently needed.
12) The debt issue is exacting a heavy toll on resources utilization. With 40 percent of our national budget allocated to debt service, projects and programs that would relieve poverty are sacrificed. Unfortunately, there is a direct relationship between poverty and pollution. Easier terms on loan repayment, including the possibility of a debt moratorium, must be given serious consideration.
13) Finally, government executives, legislators, and policymakers should recognize sustainable agriculture as an economic, social, political, and environmental necessity. The shift to natural farming systems and practices will be significantly catalyzed with strong government support and will move us toward our ultimate goal of a more sustainable agriculture.

References

Aspiras, R. B., B. T. Onate, and V. Gapud. 1989. Genetic imperialism in the third world: The Philippine experience with IRRI. In Global development and environment crisis - Has human kind a future? Sahabat Alam Malaysia, Jutaprint, Penang, Malaysia.

FAO, 1977. China: Organic waste recycling in agriculture. FAO Soil Bull. No. 40. Food and Agriculture Organization, United Nations, Rome.

Khor Kok Peng. 1989. The third world environment crisis: A third world perspective. p. 15-30. In Global development and environment crisis - Has human kind a future? Sahabat Alam Malaysia Jutaprint, Penang, Malaysia.

King, A. and H. Cleveland (ed.). 1980. Bioresources for development: The renewable way of life. Pergamon Press. 345 p.

Loevinsohn, M. E. 1983. Evidence of increased human death rates in rural Nueva Ecija subsequent to the widespread adoption of insecticides. IRRI, Los Banos, Philippines.

Mendoza, T. C. 1989. Achieving sustainable agricultural production and formulation of some policy imperatives. Working Paper of the Center for Policy and Development Studies, of the University of Philippines. Los Banos. Philippines.

Modina, R. B. and A. R. Ridao. 1987. IRRI rice: The miracle that never was. ACES Foundation, Inc., La Ignaciana Apostolic Center, Manila. 152 p.

Onate, B. T. 1989. Terminate IRRI's green revolution and genetic imperalism: sustainable agriculture, the alternative. An updated version of the author's articles: Why the Green Revolution has failed the small farmers, 1985, Third World Network, Penang, Malaysia and the Third world peasants and industrial development: Solidarity with the Filipino peasantry, 1986, International Solidarity Conference on Peasants' Solidarity, Metro Manila, Philippines.

Patriquin, D. G., N. M. Hill, D. Baines, M. Bishop and G. Allen. 1986. Observations on a mixed farm during the transition to biological husbandry. Biological Agriculture and Horticulture. 4: 69-154.

Perlas, N. 1989. Development and environment in the age of biology: Assessing and controlling the profound impacts of biotechnology of nature, human beings and society. p. 147-195. In Global development and environment crisis - Has human kind a future? Sahabat Alam Malaysia Jutaprint, Penang, Malaysia .