Nature Farming in Venezuela: Constraints and Prospects

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Introduction

During the last four decades Venezuela has experienced some dramatic changes in agricultural development and technology. In view of our abundant revenues from petroleum exports, the government gave high priority to the development of a "modem agriculture" and financed many expensive programs to bring new lands into agricultural production using large-scale machinery and implements, with heavy emphasis on chemical fertilizers and pesticides. Easy credit and subsidies were provided to finance all sorts of agricultural production, processing and marketing enterprises, and to introduce advanced technologies from developed countries. This so-called "Agricultural Revolution" focused primarily on increasing the production of cereal crops (mainly rice) on large farms, although smaller farms also utilized the new technologies, particularly chemical fertilizers and pesticides.

The social, economic and environmental costs of this transformation of our agricultural system have been astronomical. Fragile lands have been extensively degraded through wind and water erosion, surface and ground waters have been polluted by sediment, fertilizers and pesticides. Moreover, there is increasing concern about food safety and quality, as well as human and animal health, from the long-term use of pesticides. Consequently, there is an urgent need to develop research and education programs to demonstrate that nature farming can offer a viable alternative to a chemical-based, conventional agriculture.

The Current Situation

Table 1 shows the costs of pesticides that were imported by Venezuela between 1984 and 1988. The total expenditure for these chemicals doubled during this five-year period, increasing from approximately $10 million U.S. dollars in 1984 to $20 million in 1988. However, the increased use of pesticides does not appear to have resulted in a corresponding increase in agricultural production, based on the daily available food calories per person in Venezuela during that time. Table 1 shows that the daily available food calories from 1979 to 1981 (and prior to the sharp increase in pesticide usage) was 2,133 calories per person. During the years of heavy pesticide usage (1986 to 1988) the daily available calories increased to only 2,231 calories per person, or by less than 5 percent. On the other hand, Table 1 indicates that the increased use of pesticides in Venezuelan agriculture during 1984 to 1988 appears to be highly correlated with the increased price of agricultural products received by farmers.

Table 1. Value of Pesticides Imported into Venezuela and the Index of Crop Prices Received by Farmers From 1984 through 1988, and the Daily Available Food Calories Per Person From 1979 through 1988.

Parameters	Year				
	1984	**1985**	**1986**	**1988**	**1987**
Value of pesticide imports (x$ 1000)	9,908	8,989	11,025	19,938	19,963
Crop price index	100	113	125	157	201
Available calories (1979-1981)	2,133				
(1986-1988)	2,231				

Source: FAO Trade Yearbook (1989) and FAO Production Yearbook (1989).

It is important to realize that Venezuelan farmers have not yet reached the level of knowledge and experience in managing agricultural systems that has been acquired by farmers in Asia, North America, and Europe. Most of our farmers are beginners in one way or another. They read about

new agricultural practices and technologies in books and magazines and have a strong desire to "catch up" with modern agriculture as it is practiced elsewhere. This explains why they are eager to adopt new, and often inappropriate, technologies regardless of the cost or effect on the environment. Like many other farmers, they welcomed the use of chemical fertilizers and pesticides because of the promise of increased yields and profits. Certainly, the use of these agrichemicals was greatly enhanced by the availability of credit and subsidies. Large farmers, those fanning more than 100 hectares of land, appear to be less careful in handling and applying pesticides, and there is considerable evidence that they are often used indiscriminately and at excessive rates. A lack of knowledge concerning environmental consequences of pesticide misuse by these supposedly modern farmers has caused a major conflict between them and the environmentalists.

Pesticide Use in Rice Production

Rice production is an important part of Venezuelan agriculture (Castillo, 1989; 1990). About 40 years ago our government sponsored a program to clear a large forested area of Portuguesa State for rice production. The area was progressively deforested and direct seeded to rice during the wet season.

During the early years, the rice crop was hand-weeded using machetes. Later, the introduction of 2,4-D controlled all of the broad-leafed weeds which were most common initially. However, after two or three years grasses became a serious new problem, particularly barnyard grass (*Echinochloa colonum* L.). The herbicide propanil was effective in controlling the grasses and left the rice fields very clean. Then a different problem arose, i.e., caterpillars, mainly *Spodoptera (Laphygma) frugiperda*. The result was that the propanil-treated rice crop was devastated by the caterpillars. Consequently, for future rice crops the propanil herbicide had to be formulated with residual insecticides to control caterpillars.

In due course, the weed problem in these direct-seeded rice fields became even more complicated because dormant seeds of weeds such as *Rottboellia exaltata* L. were not controlled by the contact action of the herbicide. Moreover, some relatives of wild rice such as *Oryza latifolia* Desv. were not controlled by the herbicide. The lesson to be learned here is that while herbicides might control weeds as new lands are developed for crop production, they may not control new and more persistent weeds that arise later on.

Effect of Pesticides on Wildlife and Human Health

Unfortunately, over the last 40 years the use and misuse of insecticides, particularly the residual broad-spectrum chemicals, have virtually eliminated many beneficial insects that serve as natural predators for the harmful ones. Populations of predaceous vertebrates such as hawks, owls, and snakes have declined drastically because of the continued and excessive use of residual insecticides. Also, the natural habitats of these animals have often been destroyed by deforestation which also contributes to their decline.

Because of habitat destruction, rodents and birds in their efforts to survive can cause extensive damage to agricultural crops, especially rice (Castillo and Lander. 1990). In some cases, farmers whose crops were threatened by birds have deliberately poisoned irrigation canals with insecticides to reduce the bird populations. In a study conducted at the Central University of Venezuela, Anzola (1983) screened the milk of nursing women for traces of chlorinated hydrocarbon insecticides. He found that some 60 percent of these rural women were carrying residue levels of the insecticides that exceeded the acceptable daily intake values allowed by the World Health Organization.

By consuming water from irrigation canals, streams, and drainage ditches, these women were poisoning themselves and their babies. A report of this study was sent to the Departments of Agriculture and Public Health, although little was done because of the wide scope of the problem. Officials were reluctant to conduct a public campaign of warning because of the expected psychological impact and panic reaction of these rural women, and the concern that they would stop nursing their babies for fear of poisoning them.

Thus, it is obvious that there is a great urgency to replace our "modern" chemical-based, conventional farming system with nature farming or natural farming methods that can avoid or largely exclude the use of pesticides.

Future Prospects for Nature Farming in Venezuela

The feasibility and practicability of nature farming will depend on seeking viable methods for controlling weeds and conserving soil moisture. Research to accomplish this has already been conducted in Venezuela using plastic mulches (Castillo and Mantilla, 1989) and thin asphalt films (Pla, 1975; Pla *et al*., 1984). In the first case, there was a four-fold increase in the yield of cassava, and in the second case sorghum yields were doubled. Nevertheless, weed control and soil moisture conservation are only two components of a farming system, and it will take considerable research to develop productive, profitable and sustainable farming systems that are not dependent on chemical fertilizers and pesticides.

Currently, there are some 200 non-government organizations (NGO's) now in Venezuela that are included in programs to preserve and protect the environment. However, only a few are actually engaged in efforts to develop alternative or natural farming systems. One such organization is FundaGrea, the Foundation for the Development of Ecological Agriculture, Recycling and Alternative Energy, with headquarters in Caracas. FundaGrea was established about eleven years ago with the principal objective of providing technical assistance for improving the socioeconomic conditions of rural people who must make their living on the land. Projects sponsored by FundaGrea focus on improving human health and nutrition, environmental quality, and the productivity and stability of farming systems.

A major problem in the mountainous areas where these people live has been soil pollution and environmental degradation from discarding of coffee pulp from processing plants. To alleviate this situation, FundaGrea conducted demonstrations on how the coffee producers could compost this waste material to make a valuable biofertilizer and soil conditioner that would improve the productivity of their lands and protect them from soil erosion. Now, the smaller, non-coffee producing farmers are using the coffee pulp compost for the same purpose. There has been a definite shortage of funds to support the activities and programs of FundaGrea. Consequently, farmer' s cooperatives have been organized to provide credit and technical assistance to both large and small farmers for reducing their dependency on chemical fertilizers and pesticides.

FundaGrea has developed a highly successful outreach program which provides short courses for farmers to instruct them on how to make and use compost effectively; when and how to use green manures and cover crops; how to control soil erosion on steep slopes using practical and affordable technology; and how to adapt the principles of non-chemical weed control and non-chemical pest control.

FundaGrea, through the farmers cooperatives, has been developing programs for direct marketing of produce from the farmer to the consumer. In creating a close relationship between the producer and consumer, the whole concept that "healthy soils produce healthy food which promotes healthy people" can be better understood. This concept also encourages consumers to save vegetable wastes from produce so that they can be returned to the same fields where the crops were grown.

A high priority FundaGrea program is that of teaching rural women how to grow a more diverse and productive home vegetable garden. Demonstrations are provided on the best ways to prepare and preserve foods. This helps to improve the local diet, and to enhance the health and nutrition of rural people, particularly children.

Other technologies provided by FundaGrea include biogas digestors for the production of biogas for cooking and heating; and solar energy technology for heating water, especially at the higher elevations where natural fuel sources may be scarce. FundaGrea receives only limited support from the Venezuelan government. Consequently, it works closely with other non-government organizations to ensure that there is a core of people in each state or region capable of providing training in all of the technologies discussed herein.

Conclusions

The introduction of advanced agricultural practices and technologies into Venezuelan agriculture have often contributed to degradation of our soil and water resources, pollution of the environment, and adverse effects on human and animal health. Many developing countries, worldwide, have experienced these same problems in converting from their traditional agricultural methods to chemical-based systems with new technologies. Some proponents have suggested that nature farming or natural farming methods are a possible alternative to chemical-based agriculture. Thus, there is an urgent need in many countries to conduct research and demonstration projects that would determine the socioeconomic and environmental advantages and long-term sustainability of nature farming compared with chemical-based systems.

References

Anzola, F. 1983. Organochlorine Pesticide Residues in Nursing Women's Milk. Ph.D. thesis. Faculty of Agronomy, Central University of Venezuela. Maracay, Aragua, Venezuela.

Castillo, J.J. 1989. Puddling rice fields. AGRO (Venezuela) l(5):21-23.

Castillo, J.J. 1990. Rice growing ecological outlook. Faculty of Agronomy Bulletin, Central University of Venezuela 39:55-72.

Castillo, J.J. and E. Lander. 1990. Granivorous birds *Porphyrula martinica* and *Jacana jacana*: New rice pests in Venezuela. p. 340. In Abstracts of Fifth International Congress of Ecology: INTECOL 90. Yokohama, Japan.

Castillo, J.J. and J.M. Mantilla. 1989. Use of lagilene plastic mulch to protect cassava (*Manihot esculenta* Crantz.) crops against weeds. Faculty of Agronomy Report, p. 35-36.

Food and Agriculture Organization. 1989a. Production Yearbook. Vol.43:346.

Food and Agriculture Organization. 1989b. Trade Yearbook. Vol. 43:380.

Pla, I. 1975. Effects of bitumen emulsion and polyacrylamide on some physical properties of Venezuelan soils. p. 35-46. Soil Science Society of America Publication No.7. Madison, Wisconsin, USA.

Pla, I., A. Florentino, and D. Lobo. 1984. The use of asphalt emulsion to increase and regulate sorghum productivity in an Alfisol sandy loam soil in Guarico State (Venezuela). Agron. Trop. (Venezuela) (1-3):49-61 .