

# **Agroecology and Sustainable Rural Development in Latin America**

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## **Introduction**

Today, I would like to discuss what some non-governmental organizations (NGO's) are doing in Latin America by applying agroecological principles in the development of sustainable farming systems for small farmers. Latin America is a very diverse region, both ecologically and culturally. Agriculture in Latin America comprises many different kinds of systems which are often dependent on specific climatic conditions including semiarid tropics, humid tropics, sub-humid tropics, tropical lowlands, mountainous highlands, and mediterranean-type ecosystems. Each of these regions is subject to problems and constraints that limit agricultural productivity. For example, in the highlands of the Altiplano of Peru and Bolivia, farmers are confronted with growing crops under adverse conditions of high elevations, low temperatures, and marginal soils. Also, in the tropical lowlands, there are problems in farming steeply sloping lands subject to intense and excessive rainfall, as well as acid soils. In northeast Brazil there are special problems of water management and unfavorable soil conditions that limit productivity.

There are two different types of agriculture that are practiced in Latin America. One is called the Minifundio System which includes the small farmers and campesino (i.e., peasant) sector. The other is referred to as the Latifundio System which includes the large-scale, commercial farmer sector. The distribution of land between these two sectors is very disproportionate. In some countries of the region small farmers often comprise 80 percent of the total but their activities are limited to only 20 percent of the total available land, much of which is marginal by most definitions. Large farmers, however, may comprise only 20 percent of the total farmers, but control 80 percent of the total agricultural land.

The roles of these two sectors is quite different. In some countries, most of the food crops for consumption including maize, beans, and potatoes, are produced by small farmers and campesinos (i.e., the peasant farmer sector). However, most of the plantation-type crops for export are produced by the large-scale, commercial farms. Thus, the importance of the small farmer's contribution to food self-sufficiency throughout the region becomes very apparent.

## **Agricultural Revolutions in Latin America: Past and Present**

There have been many attempts to "modernize" peasant agriculture in Latin America. Some programs have introduced packages of technical innovations including mechanization, chemical fertilizers, pesticides, alternative crops, high yielding varieties, and most recently the new biotechnology which emphasizes genetic engineering. Most of these initiatives were implemented by the International Agricultural Research Centers (IARC's), the National Agricultural Research Programs (NARP's) and the State Agricultural Experiment Stations (SAES) in the United States. While these institutions are supposed to help small farmers improve their production and productivity, the technological packages that were offered to them were often developed under optimum conditions of soil, water, chemicals, HYV's, mechanization, and ready access to credit, markets and other inputs, most of which the small farmer could not afford. The extremely marginal conditions under which small farmers struggle to survive, and their remote-ness from markets and technical assistance, were given very little consideration.

Thus, it should not be too surprising that most of these revolutions to assist the small farmer to improve his production, profitability, and quality of life essentially failed. It is interesting to note, however, that these technological packages of improved seeds, fertilizers, pesticides and mechanization were readily adopted by the large commercial farmers. The cost of these inputs to the small farmers was prohibitively expensive, although this may have been a blessing since they did not readily adopt the use of chemical fertilizers and pesticides. Consequently, the commercial farming sector has become largely responsible for the adverse effects of agrichemicals on food safety and quality, human and animal health, and environmental quality.

Despite the good intentions of the agricultural revolutions which were to improve agricultural production and productivity for small farms in Latin America, the level of rural poverty still remains very high. For example, in Brazil more than 70 percent of the rural population lives under conditions of abject poverty. Future initiatives to help these small, poor farmers must do three things. First, they must actually benefit the small farmer in ways that they can understand; second, they must help to solve the problem of rural poverty; and third, they must offer low-cost, affordable, proven technologies that are acceptable to the farmer and that he/she will adopt.

### **An Agroecological Approach to Sustainable Rural Development**

The challenge in Latin America today and in the future is to develop farming systems for small farmers that are productive, profitable, stable, and sustainable over the long-run. The question is how to transform peasant agriculture from a subsistence level that often contributes to the continued degradation of the natural resource base, to a low-input/sustainable system that utilizes indigenous knowledge, local resources, and internal inputs. It is noteworthy here to realize that these farms are often less interested in the highest possible crop yields than they are about the consistency and stability of their yields. As already mentioned, the technological innovations that have been offered to small farmers over the past two or three decades are not compatible with their agroecological conditions.

Thus, an agroecological approach is urgently needed to enhance the sustainability of rural development in Latin America. This includes the establishment of new research and technology transfer capabilities that can increase the productivity of small farmers and improve their quality of life. During the last two decades, a number of non-governmental organizations (NGO's) have made considerable progress in providing effective programs and appropriate technologies to improve the conditions and capabilities of small farmers in Latin America. Their approach has been to study the farmer's indigenous knowledge of plants, soils, natural biological cycles, ecological processes, and traditional farming practices, and to combine this knowledge along with certain elements of modern agriculture into an integrated, holistic management system. This approach has been highly acceptable to the farmers because it does not attempt to replace or radically change the peasant system, but rather to improve and optimize it while conserving the natural resource base and protecting the environment.

### **Features of the Green Revolution Compared with Agroecological Technologies**

Table 1 lists some of the features of the Green Revolution, which were used to transform traditional agriculture in some developing countries during the 1950's and 1960's, compared with the agroecological approach that some NGO's are now following in Latin America. As indicated in Table 1, the Green Revolution was an attempt to demonstrate how the application of modern technology could dramatically increase agricultural production in Third World countries.

The Green Revolution, however, required the adoption of certain practices and technologies that virtually severed any connection with traditional agriculture. The basic elements of the Green Revolution involved the application of irrigation technology, often on the best and most productive farmland, to produce mainly cereal crops (i.e., wheat, rice and maize) that required costly external inputs of fertilizers, pesticides, machinery and credit (Table 1).

On the other hand, the agroecological focus of the NGO's have emphasized (a) utilization of indigenous knowledge and technologies, (b) preservation of native crop germplasm, (c) use of local and on-farm resources, (d) biological pest control, (e) improving the production of basic food crops, (f) improving the natural resource base through appropriate soil and water conservation practices, (g) conservation farming of marginal lands (especially steep slopes), (h) use of nitrogen-fixing food and forage legumes, (i) recycling of crop residues and animal manures as soil amendments and biofertilizers, and (j) reducing the use of purchased (i.e., external) inputs, especially chemical fertilizers and pesticides.

**Table 1. A Comparison of Some Features of the Green Revolution and Agroecological Technologies in the Development of Agricultural Production Systems in Latin America.**

<b>Characteristic</b>	<b>Green Revolution</b>	<b>Agroecology</b>
Crops affected	Wheat, rice, maize and few others	All crops
Areas affected	Flat lands, irrigated areas	All areas, especially marginal areas (rainfed, steep slopes)
Dominant cropping systems	Monocultures, genetically uniform	Polycultures, genetically heterogeneous
Dominant inputs	Agrochemicals, machinery, high dependency on external inputs	Nitrogen fixation, biological pest control, organic amendments, high reliance on on-farm resources
Environmental impacts	Medium-high (chemical pollution, erosion, salinization, pesticide resistance, etc.)	Low-medium (nutrient leaching from manure, etc.)
Crops displaced	Mostly traditional varieties and landraces	None
Technology development and dissemination	Quasi-public sector, private companies	Largely public, NGO involvement
Capital costs of research	Relatively high	Relatively low
Research skills needed	Conventional plant breeding and other disciplinary agricultural sciences	Ecology and multi-disciplinary expertise
Proprietary considerations	Varieties and products patentable and protectable by private interests	Varieties and technologies under farmers' control

Source: Kenny and Buttel (1985) and modified by Altieri (1992).

### **Conclusions**

In view of the current economic and social conditions throughout Latin America, there is an urgent need for an agroecological approach to achieve a more sustainable agriculture, especially in the case of small farmers. This approach seeks to integrate the indigenous knowledge and technologies of traditional agriculture with certain elements of modern agriculture into farming systems that are more productive, profitable, stable and sustainable over the long-run. The objective is not to replace or radically change the existing system, but to improve and optimize its production and productivity while conserving the natural resource base and protecting the environment.

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