Sustainable Rural Development

Miguel A. Altieri, *Chile*
A graduate in agronomy at the University of Chile, since 1980 he has taught Agroecology at the University of California, Berkeley. His studies on the biological control of phytopathologies and, in general, on sustainable agriculture make him one of the world's major champions of agroecology.

THERE IS A GENERAL CONCERN THAT THE GROWING PUSH TOWARD INDUSTRIALIZATION AND GLOBALIZATION OF THE WORLD'S AGRICULTURE IMPERILS THE FUTURE OF HUMANITY AND THE NATURAL WORLD. CORPORATE-CONTROLLED, AGROCHEMICALLY-BASED, MONOCULTURAL, EXPORT-ORIENTED AND INCREASINGLY TRANSGENIC CROP DOMINATED AGROECOSYSTEMS ARE NEGATIVELY IMPACTING FOOD QUALITY, PUBLIC HEALTH, ECOSYSTEM INTEGRITY, TRADITIONAL RURAL LIVELIHOODS AND INDIGENOUS AND LOCAL CULTURES, WHILE INCREASING ALIENATION OF PEOPLES FROM NATURE AND THE CULTURAL AND NATURAL CONNECTION OF FARMERS AND ALL OTHER PEOPLE TO THEIR SOURCES OF FOOD AND SUSTENANCE.

This transition is accelerating food insecurity, hunger, landlessness, migration and a number of social conflicts by destroying the local economic and cultural foundations of rural societies.

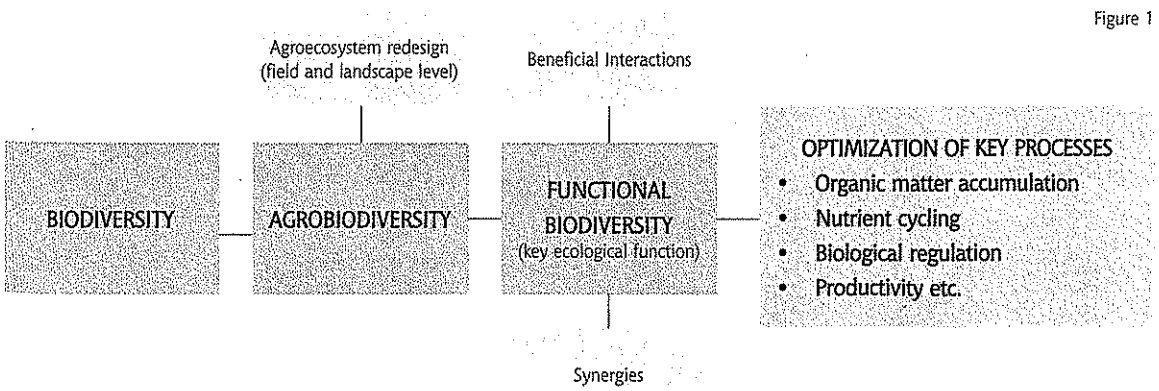
Despite all the above problems associated with industrial agriculture, hundreds of new and alternative initiatives have emerged around the world aimed at promoting ecological forms of agriculture, which preserve the livelihoods of small farmers, produce healthy, safe and culturally diverse foods, and close the local cycles of production, trading and consumption. Another agriculture is not only possible, it is already happening taking a multitude of expressions. Today we can witness around the world, new approaches and technologies spearheaded by farmers, NGOs and some government institutions which are making a significant contribution to food security at the household, national, and regional levels while conserving natural resources.

Two main forms of alternative agriculture dominate: a) a more specialized, market-led form of organic agriculture as practiced in North America, Europe and the areas of commercial agriculture in the developing world. Worldwide, there are about 25 million hectares of certified organic agriculture. Organic farms can be as productive as conventional ones, but without using agrochemicals. By featuring legume-based rotations, use of compost and a series of diversified cropping systems such as cover crops or strip cropping, including crop-livestock mixtures, organic farms can be as productive as conventional ones, but without using agrochemicals. Research shows that these systems exhibit acceptable yields, enhance agro-biodiversity, consume less energy, conserve soil and water, while inducing minimal environmental impact; b) a peasant based, more subsistence oriented traditional agriculture whereby thousands of small producers in partnership with NGOs and other organizations, have promoted alternative agroecological development projects aimed at enhancing the food security of rural families, conserving and/or regenerating the natural resource base (soil, water and germplasm) and providing income opportunities to combat poverty.

The science that fuels these initiatives is agroecology, which is defined as the application of ecological concepts and principles to the design and management of sustainable, biodiverse and socially just agroecosystems. The idea of agroecology is to develop agroecosystems with minimal dependence on external inputs, emphasizing complex agricultural systems in which ecological interactions and synergisms between biological components provide the mechanisms for the systems to sponsor their own soil fertility, productivity and crop protection. By assembling a functional biodiversity (that is a collection of interacting beneficial organisms that play key functions in the farm) it is possible to initiate synergisms which subsidize farm processes by providing ecological services such as the activation of soil biology, the recycling of nutrients, the enhancement of beneficial arthropods and antagonists, and so on, all important in determining the sustainability of agroecosystems (Figure 1).The exploitation of these interactions in real situations involves novel farm designs and management which requires an understanding of the numerous relationships between soils, microorganisms, plants, insect herbivores, and natural enemies. Breakthroughs in sustainable production have already been achieved in many countries using agroecological approaches that emphasize diversity, synergy, recycling and integration; as well as social processes that value community involvement and empowerment.

Recognizing that throughout the developing world there are still microcosms of intact traditional agriculture which represent millenary examples of successful forms

Figure 1



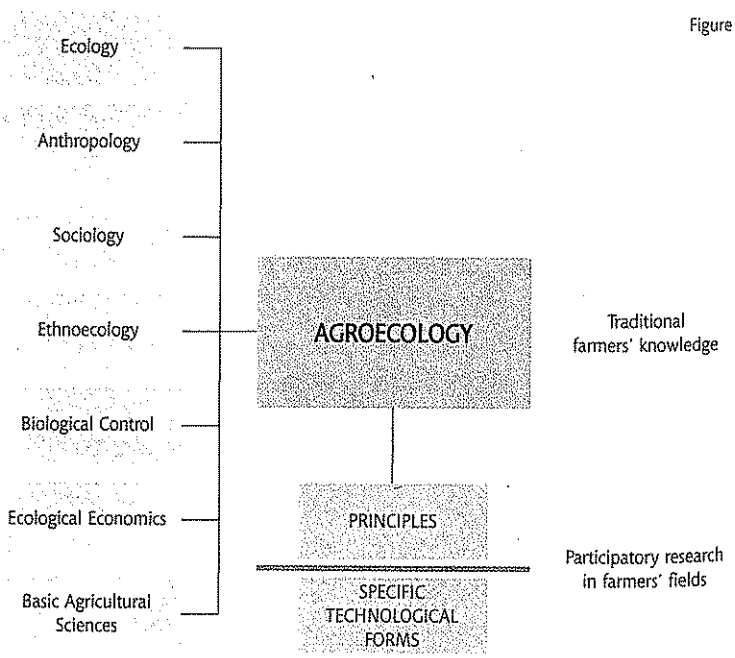
of community-based local agriculture and which offer promising models for other areas as they promote biodiversity, thrive without agrochemicals, and sustain year-round yields, agroecology serves as bridge to promote a dialogue of wisdoms between modern scientific agricultural knowledge and indigenous knowledge systems. The combination of formal western science and ethnoscience provide the principles to design and manage sustainable farming systems, which will take specific technological forms according to local socio-economic and environmental conditions, but that in order for these technologies to be relevant to farmers needs and circumstances emerge from a participatory research process in which farmers are key actors in testing, evaluating and disseminating the best agroecological techniques (Figure 2).

Principles

Key agroecological principles to design successful sustainable systems include:

1. Recycling of biomass and balancing nutrient flow and availability.
2. Securing favorable soil conditions for plant growth, through enhanced organic matter content and and activation of soil biology.
3. Minimizing losses of solar radiation, air, water, soil and nutrients by way of microclimate management, water harvesting and soil cover.
4. Enhancing species and genetic diversification of the agroecosystem in time and space at the field and landscape level, including animal integration
5. Enhancing beneficial biological interactions and synergisms among agrobiodiversity components to promote key ecological processes and services such as natural pest control, soil fertility, plant health and productivity.

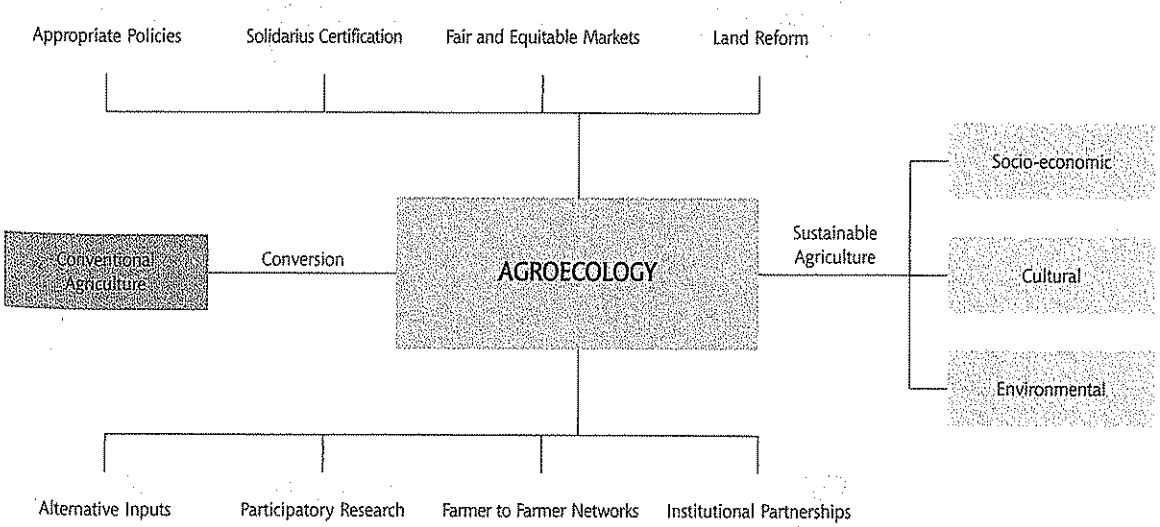
Figure 2



When the above agroecological principles are adopted, yield enhancement and stability of production are achieved, as well as a series of ecological services such as preservation of agrobiodiversity, soil and water conservation and enhancement, improved biological pest control etc., regardless of scale or farm size. What varies are the technological forms utilized to optimize key agroecological processes. This variation is best made by farmers themselves; in industrial countries is expressed as organic agriculture while in the developing world it takes the form of a myriad of traditional biodiverse farms. In this new approach to agriculture, social capital formation is as important as the regenerative technologies involved, because what is key to local livelihoods is the capability of local communities to innovate, evaluate and adapt as they involve themselves in a development process based on local knowledge and organization. These experiences, which emphasize farmer to farmer research and grassroots extension approaches, represent countless demonstrations of talent, creativity and scientific capability in rural communities throughout the world. They point to the fact that human resource development is the cornerstone of any strategy aimed at increasing options for rural people and especially resource-poor farmers.

Farmers are adopting agroecologically based systems as a means of increasing income, stabilizing yields, improving food security, reducing dependency on external inputs and enhancing biodiversity and natural resources. These systems are rapidly growing in the South (Brazil, Cuba, Venezuela etc.) and although data is far from complete, latest estimates of land under agroecological management vary from 15-30 million hectares (equivalent to about 3 percent of the agricultural land in the South). Major changes need to be made to make sure that agroecological innovations are broadly accessible, and widely disseminated so that their full benefit for sustainable food security and biodiversity conservation can be realized. Political will, appropriate policies (i.e. land reform), solidarious markets, innovative mechanisms that link farmers and consumers more directly, institutional reforms to support agroecological research and extension etc. are essential. Consumers must be aware that eating is both an ecological and political act, and that through their choices they can strengthen either industrial or

Figure 3



agroecological models of production. Existing subsidies and policies for conventional chemical and transgenic approaches must be dismantled. Corporate control over the food system must also be challenged. As seen in Figure 3, agroecology provides scientific and methodological tools to transition from conventional agriculture to more sustainable production system. However, technical approaches are not sufficient to achieve the goals of a sustainable rural development agenda (food sovereignty, access to land, water and seeds etc.), other vectors (equitable markets, conducive policies, farmer to farmer networks etc.) must be in place.

The ultimate challenge is to increase investment and research in agroecology and put in motion processes to scale up projects that have already proved successful to thousands of other farmers. This will require protecting small farmers from the globalized markets, providing them with equitable access to natural resources and committed state support (Figure 4). Only then will agroecological approaches generate a meaningful impact on the income, food sovereignty and environmental well-being of the world's population, especially of the millions of small and family farmers as yet untouched by — or already adversely affected by — conventional modern agricultural technology.

REQUIREMENTS FOR A TRULY SUSTAINABLE AGRICULTURE

Figure 4