

COMMENTARY

An agroecological perspective to guide graduate educational programs in agricultural economics and rural development in Latin America of the XXI Century

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1. Introduction

During the 1980s, ‘the lost decade’, Latin America went through an economic crisis characterized by extraordinary social and environmental costs, in most cases not accounted for by neoliberal economists. Despite many international and/or national rural development projects, poverty, food insecurity, health deterioration and environmental degradation are problems that continue affecting the rural population (Leff, 1994). To many, it has become evident that the conventional models of agricultural modernization, based on high use of agricultural inputs and oriented to maximizing returns and profits, have been often detrimental and unviable when considered from social and ecological perspectives (Kaimowitz, 1996). There is evidence that the agroexport model of development with its excessive reliance on monoculture and capital-intensive technology has negatively impacted the environment and

rural society. Topsoil is increasingly being lost, genetic diversity is eroding and chemical pollution of soil and water resources is rampant (Murray, 1994; Conroy et al., 1996). As Latin American countries are increasingly inserted into the new international economic order, the export-oriented agrarian model expands in the absence of equitable land distribution promoting high input technologies, and thus benefiting primarily the wealthy producers who control the best quality lands and with privileged access to credit, markets and capital (Altieri and Yurjevic, 1991). These changes have widened the gap between peasants and commercial farmers, triggering a series of worrisome tendencies and processes (Conroy et al., 1996; Mander and Goldsmith, 1996):

1. Although many peasants have been integrated into the non-agricultural labor movement as a result of migration to urban centers, peasant agriculture continues providing the cities with low cost food, thus subsidizing consumers. The peasant population on the hillside represents 40–60% of the rural poor occupying up

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- to 30% of the total agricultural lands in which peasants' production still subsidizes urban demand for food while receiving low prices for their products.
2. In a region in which food is produced to feed the whole population and where general production has increased, hunger persists. Even malnutrition has increased in many rural areas and marginal urban sectors. It is clear that policies oriented toward increasing agricultural production, instead of guaranteeing access to food and/or productive resources for the poor are of limited value.
 3. The production of basic crops (maize, potatoes, cassava, etc.) lags below the production of cattle forages and industrial crops (non-traditional) for exports. While exports' revenues have declined for coffee, cocoa, and cotton during the 1980s, exports of non-traditional crops have increased in a range of 4–11%.
 4. The use of agrochemical inputs has increased significantly in the region, especially the use of fertilizers on commercial crops and pesticides in crops like cotton and tomatoes. Few studies have measured the environmental impact of this intensification. Irrigation is applied in approximately 11% of the arable land, but is expanding to ecologically unsuitable lands causing serious problems of salinization and desertification.
 5. Land tenure has become increasingly concentrated. The number of small farmers and peasants has increased, but the average size of their landholdings has decreased. On the other hand, large landowners control most of the best agricultural lands, the best soils and in many cases the water resources, pushing small farmers to the slopes or to colonize the low humid tropics, thus accelerating the advance of the agricultural frontier with the consequent processes of erosion and deforestation.

The above tendencies have accelerated since the 1980s as perverse market incentives in many Latin American countries made it cheaper for those nations to import their food from the USA and Europe rather than producing it themselves (Audirac, 1997). Deregulation and the fall of trade barriers have stimulated the import of grain, and

in countries that up to recently were self-sufficient in food production, grains are sold by governments at prices invariably lower than local prices, with disastrous economic consequences (Conroy et al., 1996). This crisis resulting from highly leveraged agricultural surplus has become a major cause of Latin American dependence on agriculture imports. New policy proposals to eliminate such perverse market incentives and their corresponding ecologically and economically destructive effects, are major challenges to ecological economists of the region.

No doubt that rural environments in Latin America have suffered profound transformations triggered by neoliberal policies aimed at increasing returns and economic revenues. Due to enhanced awareness about the negative impacts of these transformations, in the last decade or so, a sustainable agricultural movement has emerged concerned about the environmental degradation associated with agricultural intensification. The majority of the scientific circles in agriculture have arrived at a general consensus that modern agriculture confronts an environmental crisis (Leff, 1994). The very nature of the agricultural structure and prevailing policies have led to this environmental crisis by favoring large farm size, specialized production, crop monocultures and mechanization. As farmers are integrated into international economies, imperatives to diversity disappear as monocultures are rewarded by economies of scale. In turn, lack of rotation and diversification take away self-regulating mechanisms, turning monocultures into highly vulnerable agroecosystems dependent on high chemical inputs (Altieri, 1995a). Such systems are also highly susceptible to suffer degradation of their natural resource base through processes of soil erosion, salinization, contamination with pesticides, desertification, loss of biodiversity, with the consequent progressive reduction of productivity (Redclift, 1989). The ecological crisis that accompanied the rise and fall of cotton in Central America in the 1970s and the resurgence of environmental problems associated with non-traditional export crops (NTAEs) in Latin America during the 1980s and 1990s are sad reminders of what may happen when ecological principles are

ignored or overridden by economists and policy makers (Murray, 1994).

Clearly, it is necessary to adopt a new approach in rural and agricultural development to secure food self-sufficiency, to preserve the natural resource base, and to ensure social equity and economic viability. This approach seeks the revitalization of peasant and small family farms and the reshaping of the entire agricultural policy and food system in ways that are economically viable to farmers and consumers (Yurjevic, 1996). The implementation of this approach, however, will not be free of controversy as differences in perspective between multilateral donors; governments and NGOs are quite marked as evidenced in the recent Food Summit held in Rome in November 1996. Non governmental organizations criticized the Summit for stressing trade liberalization rather than equitable distribution and farmed approaches to sustainable agriculture as the primary means for achieving food security.

2. Agricultural crisis and the imperative of agricultural education

One of the challenges in agricultural education is to realize the fact that the contemporary agricultural problematique has evolved from a technical and productive one, to include social, economic, cultural and ecological dimensions. In other words, the central preoccupation of the various sectors involved in rural development is that of the sustainability of agriculture (Barbier, 1987). The development of the concept of sustainable agriculture is a relatively new response to the concern for the degradation of natural resources associated with modern agriculture. This concept has generated much discussion and has alerted us to the need to promote adjustments in conventional agriculture so that it becomes socially and economically more viable and competitive (Edwards et al., 1990). The idea is to develop agroecosystems with a minimum dependency on agrochemical inputs and energy, emphasizing interactions and synergisms among the many biological components of agro-ecosystems to enhance recycling and biological control, thus improving

overall ecological efficiency and environmental protection (Altieri, 1995a). In order to meet rural sustainability goals, agroecology proponents call for diversification of food production at the farm and regional levels, so that agricultural self-sufficiency that most countries once enjoyed may be reclaimed. Several possible solutions to the environmental problems created by capital and technologically intensive farming systems have been proposed and research is currently in progress to evaluate alternative systems (Pretty, 1995).

In this regard, the concept of sustainability has been controversial and diffuse because of conflicting agendas, definitions, and interpretations of its meaning. These disagreements and incompatibilities result from the varying degrees to which individual ideologies buy into the critique of dominant conventional development models, and from differences in disciplinary and professional commitments to various environmental or development paradigms (Audirac, 1997). Nevertheless the concept is still useful because it captures a set of concerns about agriculture which is conceived as a result of the co-evolution of socioeconomic and natural systems. This wider understanding of the agricultural context requires the study of relations between agriculture, the global environment, and social systems given that agricultural development results from the complex interaction of a multitude of factors (Buttel, 1980). It is through this deeper understanding of the ecology of agricultural systems that doors will open to new management options more in tune with the objectives of a truly sustainable agriculture (Gallopín et al., 1989).

It is imperative that economic and agronomic linear models of thinking be increasingly penetrated by ecological holistic thinking, so that exploitative notions of natural resource use are sensitized to notions that include ecosystem and biodiversity protection as well as social equity and justice.

3. Toward sustainable agricultural development

Given the current levels of rural poverty, environmental degradation and inequity prevalent in

most Latin American countries, the most important strategies for the development of a sustainable agriculture should focus on (Latin American Commission on Development and Environment, 1990):

1. Poverty reduction,
2. Ecological management of the productive resources located in fragile ecosystems,
3. Food security and self-sufficiency, and
4. Transformation of impoverished rural communities into social actors capable of determining their own development.

These priorities have yet to be met by most top-down national/international sponsored development approaches, which have not reached the poor nor solved hunger and malnutrition problems. In Latin America, this failure legitimized the role of non-governmental organizations (NGOs) as new actors in rural development. In the last 10–15 years, a number of NGOs have become actively engaged in grassroots rural development, focusing their attention on neglected crops, lands and people (Altieri, 1995b). Their approach has been to question ‘conventional wisdom’ in technological design through the search for new kinds of agricultural development and resource management that, based on local participation, skills and resources, enhance productivity while conserving the resource base. Indigenous cultural heritage and traditional farming knowledge are increasingly being vindicated by NGOs, in spite of powerful opposing economic and political interests. By focusing on the root causes of poverty and low land productivity, NGOs together with peasants, are also attempting to change the socioeconomic and political environment where their systems operate (Altieri, 1991).

Indigenous knowledge systems and peasants’ rationale gain unprecedented significance within this new agroecological paradigm. Peasant knowledge about soils, plants and the environment, which at times has no counterparts in modern agronomy, proves key in the process of technological generation. Some elements of this knowledge are now regarded as crucial to guide sustainable agricultural development. How to synthesize this knowledge and apply it in rural development is a major challenge facing researchers and develop-

ment specialists worldwide (Altieri and Yurjevic, 1991).

A significant number of NGOs have embraced agroecology as a unifying scientific paradigm that approaches agriculture in an integrated manner, by emphasizing the interactions between biological, technical, cultural and socioeconomic determinants of sustainability (Altieri, 1995b). Agroecology is more sensitive than conventional agricultural development approaches to the complexities of local agricultures, by broadening its performance criteria to include properties of sustainability, food security, biological stability, resource conservation, and equity along with the goal of increasing production.

Due to its novelty in viewing the question of peasant agricultural development, agroecology has heavily influenced the agricultural research and extension work of many Latin American NGOs. Impacts and achievements of NGO-led agroecological projects in various regions has been significant. Several characteristics of the agroecological approach to technology development and diffusion make it especially compatible with the discourse of NGOs (Altieri and Hecht, 1990; Altieri and Masera, 1993):

1. Agroecology with its emphasis on reproduction of the household and regeneration of the agricultural resource base provides an agile framework for analyzing and understanding the diverse factors affecting small farms. It also provides methodologies that allow the development of technologies closely tailored to the needs and circumstances of specific peasant communities.
2. Low input and regenerative agricultural techniques and designs proposed by agroecology are socially activating since they require a high level of popular participation.
3. Agroecological techniques are culturally compatible since they do not question peasants’ rationale, but actually build upon traditional farming knowledge, combining it with elements of modern agricultural science.
4. Techniques are ecologically sound since they do not attempt to radically modify or transform the peasant ecosystem, but rather to identify management elements that, once in-

corporated, lead to optimization of the production unit.

These groups, however, recognize that ultimate sustainability will be reached as farmers increase their access to land, resources and suitable technology that allows them to ecologically manage these resources and also become socially organized to secure governance of resources, equity of access to markets for inputs and products, and to a dignified income derived from harvests (Pretty, 1995).

In view of the above analysis, it will be fundamental that future agricultural professionals understand that:

1. The maximization of returns and profitability cannot be accomplished without considering the sustainability and stability of production, or without considering how the benefits of agricultural activities will be distributed among the participants in the processes of production and consumption (Conway and Barbier, 1990).
2. The problems of sustainability cannot be considered in isolation, given that production systems are linked not only to the local conditions and institutions, but that they also respond to economic and market pressures at the national and international levels.
3. It is not productive to continue conducting economic analysis that excludes the changes in productivity or the externalities associated with agricultural intensification. To ignore such 'hidden' costs overvalues degrading agricultural practices and underestimates the value of agroecological practices that preserve resources (Faeth, 1993).
4. Farmers will change their practices toward more sustainable systems only if the economic incentives exist to justify doing so. Farmers who adopt resource-conserving production systems may suffer some short-term loss of income during the transition, but the long-term financial gains from maintaining or improving their land's productivity may be substantial (Lampkin, 1990). The reverse is true with conventional farming methods. The greater the reliance on chemicals and the more disturbance through conventional tillage, the more damage to the soil. Falling productivity may be masked for a while by high-input production methods, but the income loss is inevitable.
5. It will be necessary to harmonize the objectives of sustainability with the objectives of development. Latin American countries caught up in trade liberalization have been slow to move forward in sustainable development. In general, the policy framework still favors an agriculture that is excluding and that favors natural resource degradation. The institutional capacity to promote sustainable agriculture is very weak and there is no mechanism for the massive diffusion and adoption of alternative technologies (Kaimowitz, 1996). Evidence so far suggests that the style of development associated with free trade policies tend to fuel the overexploitation of natural resources through promotion of agroexports and high-input technologies (Mander and Goldsmith, 1996). The strategies of economic liberalization like NAFTA, GATT and others that promote agroexports should combine with measures that ensure food security and agricultural sustainability at the local level.

Only by ensuring a process of rural and agricultural development that emphasizes resource conserving technologies, the strengthening of institutions, NGOs and farmers' groups, and that promotes compatible agrarian policies, will it be possible to realize the environmental and eco-

conomic benefits of sustainable agriculture to farmers, communities and nations (Thrupp, 1996). There are today in Latin America hundreds of local experiences in sustainable agricultural development implemented by rural communities and/or NGOs. These experiences demonstrate the feasibility to stabilize yields, regenerate and preserve soils and biodiversity based on agroecological technologies and locally available resources (Pretty, 1995). However, there is a need to create national policies that support these initiatives if they are to be scaled-up and disseminated in order to preserve the natural resources, improve agricultural production, enhance economic profits and satisfy human and social needs at wider levels. In this sense, the participation of ecological economists in applying all their experience and knowledge to advance agrarian policies that support the transition toward sustainability and self-sufficiency will be crucial. One of the most significant contributions expected from ecological economists is that they may lead the way in reforming or re-orienting institutions and agrarian policies and to provide a series of analytic tools to account for the natural resources in the evaluation of the true costs of agricultural productivity.

4. Establishing policies that promote sustainability

In Latin America there is clearly an urgent need to create and implement policies that stimulate the transition from modern high-input agriculture to a more resource conserving and sustainable one. Without the concurrence of supportive policies, the majority of successful experiences implemented by NGOs and peasant groups will remain in the best of cases at the local level without achieving a broader impact. Existing macroeconomic policies and institutions work against sustainability by promoting pesticides, export agriculture, and other actions that act as powerful disincentives for farmers to switch to more resource-conserving and locally relevant agriculture. Farmers can rarely make the conversion without incurring some transition costs, which in itself represents a constraint (Thrupp, 1996).

Actions and policy changes are urgently needed to overcome barriers to sustainable development and to strengthen and expand the impact of agroecological projects. Recommended actions in which ecological economists and development specialists can collaborate include (Altieri, 1995a; Thrupp, 1996):

1. Development and dissemination of agroecological practices and technologies;
2. Strengthening collaboration and exchanges among NGOs and farmers groups and their links with governmental and international agricultural research and extension systems;
3. Reform of external institutions that support agriculture;
4. Changes in university curriculums of agricultural education and in research agendas to include sustainability issues. Training designed at community empowerment to increase participation in projects of self-reliance;
5. Creation of systems of fair prices and solidarity markets, as well as of incentives for farmers in order to adopt agroecological practices;
6. Increasing the spread of information to multiply the effects of small scale initiatives;
7. Changing government policies to eliminate agro-chemical subsidies and to support innovations;
8. Increasing donor support and building state and local backing to sustain efforts.

Among the policies that support the development and dissemination of agroecology are included those that stimulate research to demonstrate the broad effectiveness and applicability of low-input technologies, increasing their dissemination among farmers and decreasing the costs associated with the transition from high-input to agroecological management. An important aspect to consider is that the conversion from a conventional system based on monoculture and high inputs to a system based on organic inputs with diversified management is not merely a process of withdrawing external inputs without compensatory replacement or alternative management. Considerable agroecological knowledge is required to direct the array of natural flows and synergisms necessary to sustain yields in a low-input system (Lampkin, 1990).

The conversion from high-input conventional system to a low-external-input management is a transitional process and is comprised of four steps (Altieri, 1995b):

1. Progressive elimination of chemical inputs,
2. Rationalization and efficiency in the use of agrochemicals through integrated pest management (IPM) and integrated nutrient management,
3. Substitution of agrochemical inputs by other energy efficient and biologically based alternatives,
4. Redesign of diversified farming systems with optimal crop/animal integration, which encourage synergisms so that the system can sponsor its own soil fertility, natural pest regulation, and crop productivity.

This conversion process could take from one to five years depending on the level of artificialization and/or the degradation of the original conventional system. From an economic point of view, the viability of the transition depends on the existence or not of a reduction of productivity as a consequence of the initial transition to an agroecological management, and on the ability of farmers to obtain a special premium for their products free of toxic residues. A key challenge in the transition process is to maintain an economic equilibrium in order to assist farmers in absorbing possible income loss due to slightly lower yields in the initial conversion phase. This problem can be avoided by securing a special market for organic products or through economic incentives available through policies that reward or stimulate agroecological production, or that otherwise penalize conventional agriculture by taxing agrochemical use or by incorporating the costs of environmental degradation in the cost/benefit analysis of farming operations (Pretty, 1995).

In addition, there is the need for a national policy of rural development that leads to partnerships between farmers, consumers, local institutions, etc., for a coordinated action to avoid the social and economic fractures that today are commonly seen in rural communities. The emphasis should be centered in maintaining local cultural and biological diversity, community participation in development decision making, the establish-

ment of networks between farmers and mechanisms to add aggregate value to local production (Conway and Barbier, 1990). The idea is not for local groups to substitute government, but rather to act as partners.

Regarding the reform of external institutions and agricultural extension programs, it will be necessary to emphasize processes and methods of participatory research and extension in which farmers and researchers work together in technological development, evaluation, and diffusion. Through a multisectoral and participatory dialogue, various groups can participate in the solution of problems, widening political perspectives and building local institutional capacity for cooperation and negotiation. This strategy can be particularly useful in resolving economic-environmental conflicts among various groups perceived as having diverging interests. It will also be important to support certain NGOs so they can widen their impact and scale-up local efforts. The promotion of links between NGOs and governmental agencies can allow the realization of an unexplored potential by exploring the opportunities that rise when resources and knowledge are shared to engage in concrete actions.

5. Implications for a curriculum in agroecology and rural development

The majority of professionals in agriculture are being trained from a disciplinary and atomistic perspective with specialization in one component of the whole agrarian system (its economy, a group of crops, soils, entomology, etc.). This specialization constitutes more of a barrier than a bridge toward the understanding of the agricultural system which is the result of the co-evolution between socioeconomic and natural systems, and has impeded agricultural researchers in appreciating the complexities of the social, economic and ecological processes that characterize today's agriculture. As the need to more globally understand the process and integration of agriculture and to incorporate sustainability criteria in the evaluation of agriculture, the training of agricultural professionals of the XXI century should necessar-

ily incorporate in the conventional curriculum more integrated approaches such as agroecology and ecological economics. Professionals of the future should understand that the improvement of agriculture is intimately linked to advances in the social, cultural, environmental and economics spheres. Agriculture is a biological and ecological activity that interacts closely with socioeconomic systems that prevail around the globe, and cannot be separated from them. The problems of rural development are more than technical problems, and these should be resolved at local as well as regional, national and international levels. To educate people about the complexities of sustainable development requires a broader appreciation of multidisciplinary themes concerning the conservation of resources, environmental impacts associated with production and the socioeconomic and cultural factors that determine the process of farmers' decision making.

It is crucial to incorporate ecological principles and knowledge into the study of complex farming systems, so those professionals are well prepared for the future design and management of a sustainable agriculture. These professionals will need the skills to:

1. Enhance agricultural productivity to satisfy food, feed, and fiber needs, increase rural income, and at the same time conserve the natural resource base;
2. Introduce ecological rationality and methods into agriculture to minimize chemical inputs and costs, complement watersheds and soil conservation programs. Plan systems according to local resources and land capabilities, and make efficient use of water, nutrients, and genetic resources; and
3. Discover long-term policies concerning pricing, taxation, land and resource use planning, research, and educational activities that will promote stable, resource efficient and equitable agriculture.

These skills are not readily acquired in today's conventional agricultural curriculum. Agroecology can help in the design of a curriculum to build this capacity in students, making them better prepared to face the future challenges of agricultural development in the region. Agroecology

can guide the training in locally adapted agriculture and in shifting the emphasis to diversify production for local consumption.

From the point of view of economists and development professionals, it is of vital importance that human economic activity is studied as an activity immersed in a wider ecosystem. It is important to create the conditions for economy to 'fit' into particular ecosystems in a way that avoids economic pressures that go beyond the carrying capacity of a specific ecosystem. It is also necessary to value the services provided by the ecosystem to the economic subsystem. In this regard, economic indicators should also reflect the degradation and exhaustion of natural resources associated with the different modes of production (Leff, 1994).

The concern of neoclassic economics for an efficient distribution of resources, for maximizing outputs on the short term and for the optimal functioning of markets, should give way to a broader vision whose main concern is to find the economic, social and institutional mechanisms conducive to the improvement of the quality of life for the urban and rural poor in Latin American countries. Thus, it will be vital to provide future economists with tools that will allow them to formulate policies aimed at initiating positive social, cultural and institutional transformations. In the spirit of a broad and critical training, it will be important that crucial themes like the following be debated within universities:

1. The role of agriculture in the economic development of the region and its role in the conservation of natural resources,
2. The impact of economic globalization on agricultural sustainability. To some, today's restructuring of the region's economy poses even greater threats to food security, environmental integrity and the livelihood of millions of farmers,
3. The importance of agrarian reform programs in relation to issues of equity, poverty and productivity, and especially in relation to trends that favor large scale vs. small farms,
4. The importance of incentives and support programs for small farmers to create economic opportunities and access to necessary inputs

and resources for increasing the productivity of their small landholdings.

5. The role of rural development programs as vehicles to reach a better quality of life through the generation of income and employment, nutrition, health, education and other social benefits,
6. The importance of production for exports vs. production for local and/or bio-regional self-reliance,
7. The need to focus the technological effort over favorable lands versus fragile and marginal environments,
8. The role of international aid and the private sector versus the public sector as promoters of development.

One theme that certainly will mark the debate is the potential of biotechnology in the development and structuring of agriculture, the restructuring of the global market, possible effects on environmental quality, etc. To the extent that with biotechnology it may be possible to eliminate the climatic and temporal-spatial barriers to produce food and to produce *in vitro* crops until now grown in the countryside, a significant displacement of farmers may be expected. In the coming half-century, traditional agriculture is likely to wane, a victim of technological forces that if unchecked, may replace outside farming with gene manipulation in the laboratory. The potential destruction of local agricultures can deprive thousands of people of their basic means of subsistence (Mander and Goldsmith, 1996). Biotechnology, on the other hand, is creating an unprecedented concentration of economic and political power as alliances are formed among the chemical, pharmaceutical, and seed industries (Kenny and Buttel, 1995). So far, the only beneficiaries of the biotechnological revolution seem to be the multinational corporations that advocate free trade and globalization.

In conclusion, a central preoccupation concerning the education of future agricultural professionals should center on examining the necessary conditions and priorities to improve agricultural sustainability in what appears to be an ecologically and socially heterogeneous Latin America. At the international level, students should understand the restrictions imposed by foreign trade

and the new economic global order increasingly controlled by a handful of powerful countries, the IMF, the World Bank and multinationals. At the national level, attention should be paid to the needs and aspirations of farmers, including the urgency that they actively participate in the process of rural development. In this regard, the role of agricultural economists and rural development specialists will be fundamental in:

1. Reorienting agricultural research and development to confront the challenges faced by the great mass of poor peasants living in fragile ecosystems, but also secure the sustainability of areas under intensive production. For this, it will be necessary to introduce and ecological-economic rationality in agriculture to regulate the use and proper management of natural resources. Such rationale can lead to the development of alternative technologies, frequently not commodifiable, but that are more conducive to the autonomy and sustainability of rural communities (Murray, 1994).
2. Complement research and development priorities with efficient institutional changes and with coordination of adequate agricultural and ecological/economical policies that ensure fair prices and markets, distribution and access to land and productive resources, and promote appropriate technical assistance, etc. (Thrupp, 1996).

It's clear that to implement a strategy of sustainable agricultural development in Latin America, a key requirement is to solve the principal social problem of the region: poverty. A viable sustainable development approach must attack the structural factors that cause poverty, among them the forces and economic policies that perpetuate it. More importantly though, it will require the concert of farmers, NGOs, scientists and local governments to engage in joint efforts to oppose and/or overcome negative forces and policies and to collaboratively search for ways to replace chemical-intensive farming methods with alternative agro-ecological approaches. The few relatively small and isolated partnership efforts in existence in the region (Pretty, 1995; Thrupp, 1996) demonstrate that such coalitions have the potential to significantly:

1. Reduce agrochemical inputs and costs, as well as health risks;
2. Regulate pests and diseases at acceptable levels without use of toxics;
3. Maintain or increase yields, contributing to productivity and food security;
4. Increase the 'health' of farming systems (e.g. soil quality and resilience) and;
5. Spread the benefits equitably and empower rural communities.

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