

## Views and Ideas

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### THE QUESTION OF SMALL FARM DEVELOPMENT: WHO TEACHES WHOM?

MIGUEL A. ALTIERI

*Division of Biological Control, University of California, Berkeley, CA 94720 (U.S.A.)*

About 60% of the world's cultivated land is still farmed by traditional or subsistence methods. Polycultures are a prevalent component of these systems. For example, in the Latin American tropics 60% of the corn is grown intercropped. Similarly, in Africa 98% of the cowpea, the most important legume there, is grown in association with other crops (Francis et al., 1976). These systems, however, have been regarded as 'primitive' by western agriculturalists. This conception has led to the attitude that the existing food production problems in underdeveloped countries are due to the fact that local farmers are incapable of coping with crop production processes and that modern technologies from the temperate zones must be imported to promote suitable solutions.

Thus, in the early seventies the international network of agricultural research centers extended very rapidly. The mission was the spread of the 'Green Revolution' through the development of high-yielding varieties of wheat, rice and other cereals. Or, in other words, accumulated technical information developed over the past decades in the west was to be modified and applied to crop production in the developing countries. Naturally, the new plants were specifically bred to further the type of capital intensive grain production systems desired by Western interests, thus opening new markets for agri-business (Perelman, 1977). Unfortunately, the Green Revolution proponents did not foresee the consequences of importing 'technological packages' that had been formulated under very different ecological and socio-economic conditions. In fact, most agronomic recommendations proved to be seriously unfit to the heterogeneous characteristics of the peasants' ecology and economy (de Janvry, 1981).

Contrary to expectations, no significantly new technological packages capable of yielding increased net returns could be offered to the majority

of peasants. The new packages failed to take into account the features of subsistence agriculture — ability to bear risk, labor constraints, symbiotic crop mixtures, diet requirements, etc. — that determine the management criteria and levels of resource use by local farmers. In the majority of cases, new varieties could not surpass local varieties when managed with traditional practices (Perelman, 1977). The areas where the new 'miracle cereals' were widely adopted were haunted by disease epidemics. Plant breeders soon learned that planting a whole region with genetically similar varieties led to the danger of disastrous attack by either insect pests or diseases (Adams et al., 1971). Other peasants soon abandoned the new varieties because of added expenses in the production (de Janvry, 1981). For example, most small farmers could not afford the expense of a tube well in order to have irrigation, an essential component of the new technology (Perelman, 1977). Thus, it seems that only a small proportion of farmers benefited from the Green Revolution.

#### REVERTING AGRICULTURAL DEVELOPMENT STRATEGIES

Today, it is becoming very apparent that most of the rural-development programs are highly contradictory, because formulating Western models among a peasant community proves inappropriate. This overwhelming conclusion has prompted a re-examination and re-orientation of many research and extension programs, so that recommendations are consistent with the circumstances of farmers. Recently, results of studies by scientists working in farmers' fields suggest that the only way to formulate technology appropriate and adaptable to farmer's criteria and resource base is by analyzing the socio-economic and biophysical constraints of farm production (Harwood, 1979). This requires both an ecological and economic approach which formalizes the body of complex relationships implicit in traditional farm systems. It also requires a change in attitude so that traditional subsistence agro-ecosystems are no longer regarded as 'primitive' and as the product of ignorance, but rather as the product of ecological rationales, and when considered within the historic framework of their origins, these are virtually optimal agricultural systems (Egger, 1981). This renewed view of the agrarian question is starting to reveal that the hunger and malnutrition problems that plague the developing world are not due to the incapacity of the small farm sector, but to problems of institutional support, credit and marketing, and definitely to inequalities in the distribution of income and food (Lappe and Collins, 1977). Thus, at this stage, the question of agrarian development, besides being technical, is fundamentally a question of social and structural changes.

#### ECOLOGICAL FEATURES OF TRADITIONAL AGRICULTURE

Understanding farmers' existing technology and farming systems is the fundamental step in the design of appropriate development strategies. Per-

haps one of the most salient features of traditional farming systems in most developing countries is their degree of crop diversity both in time and space. This diversity is expressed through the use of multiple cropping systems or polycultures. The practice of polycultures is a traditional strategy to promote diversity of diet and income source, stability of production, minimization of risk, reduced insect and disease incidence, efficient use of labor, intensification of production with limited resources and maximization of returns under low levels of technology (Francis et al., 1976; Harwood, 1979).

Polycultures exhibit a number of desirable features of socio-economic stability, biological resilience and productivity. The following is a list of the many advantages offered by polycultural systems as compared to monoculture agriculture as practiced in modern countries (Ruthenberg, 1976):

(a) total yields per hectare are often higher than the sole crop yields even if yields of individual components are reduced;

(b) mixtures result in more efficient utilization of resources (light, water, nutrients) by plants of different height, canopy structure and nutrient requirements;

(c) diseases and pests may not spread as rapidly in mixtures because of differential susceptibility to the pests and pathogens and because of enhanced abundance and efficiency of natural enemies;

(d) they provide insurance against crop failure, especially in areas subject to frosts, floods or droughts. For example, in the highlands of Tlaxcala, Mexican farmers intercrop corn with fava beans, because fava beans survive frosts, whereas corn is completely burned;

(e) they enhance opportunities for marketing ensuring a steady supply of a range of products without much investment in storage, thus increasing the marketing success;

(f) they provide effective cover to the soil and reduce loss of soil moisture;

(g) mixtures spread labor costs more evenly throughout the cropping season, and usually give higher gross returns per unit of labor employed, especially during labor scarcity periods;

(h) in cereal/legume mixtures, fixed nitrogen from the legume is available to the cereal and the nutritional quality of the mixture is improved;

(i) mixtures in component gardens constitute experimental plots for screening exotic materials and preservation of germplasm;

(j) the shading provided by complex crop canopies helps to suppress weeds, thereby reducing the need and cost of weed control; and

(k) in mixtures a better nutrient cycling usually results. Minerals left by certain annuals are taken up by others, and the nutrient-robbing propensity of some crops is counteracted by the enriching addition of organic matter to the soil by others.

#### IMPLICATIONS FOR MODERN AGRICULTURE

High yields in modern agricultural systems are sustained by investing costly external resources of uncertain future availability. The development

of modern agricultural production has been achieved by creating large-scale, specialized farm production units, and increased mechanization and use of chemical inputs. Thus, gains in crop yield directly depend on intensive management and on the uninterrupted availability of energy and resources. Generally, increases in yields have been accompanied by a decline in genetic variability, natural soil fertility, biological pest regulation, enhanced soil erosion, and salinization and other environmental problems. Thus the development of alternative, self-sustained, energy efficient and less resource-intensive farming systems is desirable.

Understanding traditional cropping schemes, which are the result of a long selection process, may reveal important ecological clues for the development of alternative production and management systems. Through research, many alternative management systems have emerged. These include multiple cropping systems, agroforestry, minimum tillage, cover cropping and living mulches. In the design of such systems it should always be kept in mind that the goal is not short-term maximization of yield, but rather stabilization of yield with the most efficient utilization of energy and of non-renewable resources, and a minimal degree of ecosystem degradation. This is the strategy of the small tropical farmer who has managed to survive under conditions of low-quality marginal soils, low capital and no access to institutional support. Through a 'learn from the farmers' approach (Saint and Coward, 1977), the advantages of such a strategy are only now becoming apparent to Western agriculturalists. This view represents a reversal of the conventional agrarian development strategy; namely, the poor but efficient teaches the opulent but wasteful.

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