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Source: Mountain Research and Development, 21(2) : 113-117

Published By: International Mountain Society

URL: https://doi.org/10.1659/0276-4741(2001)021[0113:ARFDIT]2.0.CO;2

Mountain Research and Development Vol 21 No 2 May 2001: 113–117

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Collaboration between a Research Team and *Campesinos*

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Despite important technological achievements, agricultural research in Mexico has had little impact on the improvement of rural livelihoods in the mountains of Central Mexico. The reason for this is its failure to focus on the development of highland campesino *agriculture. The Centro de Investigación en Ciencias Agropecuarias (CICA, Research Center in Agricultural Science) of the Autonomous University of the State of Mexico has set itself the objective of using research to improve living conditions in* campesino *households and communities. This places CICA at the interface between research and development. A participatory research project on the management of agrodiversity by indigenous* campesinos *in San Pablo Tlalchichilpa, in the mountains of the State of Mexico (Figure 1), underlines the importance of taking into account all environmental, social, economic and technological aspects of* campesino *agriculture as well as the interactions between these elements. Without a more profound understanding of these elements, research cannot contribute to improving* campesino *livelihoods in a sustainable way.*

The dual character of Mexico's agriculture

Agricultural production in Mexico involves over 30 million ha (ie 16% of the territory) and accounts for 4% of the country's GNP. It is characterized by many systems that fall into two main socioeconomic categories: modern agribusiness totally oriented towards the national and global markets, and traditional indigenous smallholder (*campesino*) agriculture, developed by native Mexican ethnic groups, whose aim is to meet family and community needs. While commercial agriculture has developed on large farms and benefits from modern technology, *campesino* farming is limited by poor land as well as financial and technological constraints.

75% of Mexico is mountainous; a large proportion of the rural population lives in the highlands of Central Mexico (at altitudes above 1800 m between 18° and 22° N). Smallholder farming is the main form of agricultural production in these areas. The mountainous environment imposes a number of constraints such as unpredictable rainfall patterns, early and late frosts, steep slopes, and poor soils that limit crop yields. Coupled with high population pressure and inequitable social and economic development, these conditions have led to endemic poverty in *campesino* communities.

On the other hand, the mountains of Central Mexico have a long and rich history of agricultural development. Centuries of Meso-American farming produced tropical highland maize (*Zea mays*) races that still form the basis of *campesino* livelihoods today. The complex Meso-American *milpa* cropping system includes other useful edible and medicinal native plants such as the common bean (*Phaseolus vulgaris*) and runner bean (*Phaseolus coccineus*), squash (*Cucurbita pepo* and *C. ficifolia*) and associated crops such as *Amaranthus hypocondriacus* (Figure 2).

FIGURE 1 The hilly area of San Felipe del Progreso, Mexico, lies at altitudes between 2500 and 3000 m; it is marked by erosion due to steep slopes, heavy rains and soil type (Luvic Phaeozems). (Photo by Leon Velázquez-Beltrán)

The "green revolution" falls short

Agricultural research in Mexico was formally established at the turn of the twentieth century, with the aim of contributing

FIGURE 2 In the *milpa* system, maize is intercropped, for example with *Vicia faba* (faba bean), as illustrated on this small plot. (Photo by Leon Velázquez-Beltrán)

to the country's development—understood then only as overall economic growth—by consolidating the necessary technological infrastructure to achieve greater agricultural productivity. In conjunction with the agrarian reform of 1915, which allocated land expropriated from large estates to *campesinos*, the Mexican government established an institutional infrastructure of services and support for agricultural and rural development. The paradigm ("green revolution") was to increase production by applying scientific methods from developed countries, concentrating on staple crops (maize, wheat, beans and rice), forages and other crops, and on technical aspects of production explored under laboratory conditions: soil fertility, breeding, chemical control of diseases, pests and weeds, etc.

Overall agricultural production grew between 1940 and 1970 at a rate of more than 5% per year, and constituted the basis of the country's industrial and urban development, marked by cheap and abundant labor, raw materials and food, as well as hard currency for imports and industrialization. But despite the improved physical and social infrastructure, most rural areas remained poor: technology packages for high productivity were geared towards use by a minority of large commercial enterprises and could not be adopted by the majority of *campesinos*, further aggravating inequality and hindering development. Research simply did not perceive *campesino* reality, needs and objectives.

Research for sustainable rural development

Given that *campesino* families constitute the majority of the rural population (68%), many of whom live in the mountainous areas of central and southern Mexico, policy must aim to strengthen the *campesino* economy as the foundation for a model of sustainable agricultural development. Indeed, smallholder *campesino* agriculture is a stable form of production since it is based on a diversity of crops, thus reducing the environmental risks implicit in monoculture (Figure 3). Rural development programs must consider non-conventional resources such as social awareness, creativity, solidarity, traditional organizations, management abilities and cultural identity, which can be important means of achieving change and development since they are a part of community cultural traditions.

In order to reorient agricultural research along these lines, new approaches that largely adhere to the principle of participatory rural research have been adopted. Participatory research approaches reverse the order of research goals and objectives; their main objective is to improve the livelihoods of people and not to increase production or infrastructure. Therefore, the research agenda is based on priorities expressed by the farmers. Instead of rigid frameworks, plural and flexible attitudes are needed to enable farmers and communities to respond to development challenges and scenarios. Moreover, the new research approaches underline the importance of taking into account environmental, social, economic and technological aspects of *campesino* agriculture, as well as the interactions between these elements.

A successful participatory project

The Centro de Investigación en Ciencias Agropecuarias (CICA) is currently conducting a participatory research project on agrodiversity within the framework of

FIGURE 3 Smallholders improving soil fertility with forest mulch in collaboration with a CICA research team. On such plots maize (used for household and livestock consumption, see harvest at back) is intercropped with *Chenopodium berlanderi* (Aztec Red Spinach, one of the world's oldest vegetables), seen at left. (Photo by Ana María Pedraza-Fuentes)

the United Nations University's People, Land Management and Environmental Change (PLEC) project. Activities are taking place in the *campesino* village of San Pablo Tlalchichilpa, at altitudes between 2500 m and over 3000 m, in the municipality of San Felipe del Progreso, State of Mexico (see Figure 1). Conditions for agriculture in the area are critical. The landscape is characterized by mountains, hillslopes and intermontane valleys, with a sub-humid temperate climate subject to sub-zero temperatures from October to March, and a marked rainy season in summer (June to September, average annual rainfall about 800 mm), therefore limiting farming to just one crop per year. Agriculture takes place on slopes with volcanic soils of poor quality that are prone to erosion. Agricultural yields are low and people live in conditions of poverty that are extreme in some villages.

The *campesino* families belong to the Mazahua ethnic group, the second most important group in the State of Mexico. Families have a limited endowment of productive resources, with an average farm size of less than 3.0 ha. Owing to increasingly difficult economic conditions, the *campesinos* have expressed a great interest in farming systems that enable them to ensure food security, reduce costs, and provide supplementary sources of income. One of the main objectives of the project has been the restoration of the traditional *milpa* and associated cropping systems.

From monocultures back to *milpa*

Soils already low in fertility (lack of nitrogen and phosphorus) have been further degraded by maize monoculture, which places excessive demands on soil nutrients and requires intensive use of synthetic fertilizers. Historical as well as scientific evidence has shown the advantages of intercropping maize with leguminous crops in the highlands of Central Mexico. Moreover, owing to conditions resulting from the North America Free Trade Agreement (NAFTA), market-oriented maize monocultures in the highlands produce less income and have proven more vulnerable than intercropping systems, as they are grown at high cost on small *campesino* farms at the limits of ecological carrying capacity.

The project relies on the close relationship between *campesino* families and the research team, who share their lives, knowledge and practices. On-farm experiments and monitoring are undertaken jointly with *campesinos* to analyze, measure and compare resource management methods and technologies to improve existing systems (Figure 4). This has led to reintroduction of the traditional Meso-American *milpa* system, characterized by agrobiodiversity, and, where appropriate, introduction of new crops or technologies

FIGURE 4 Farmers and researchers in San Felipe del Progreso Municipality collaborate to increase the sustainability of agricultural activities in this mountain region. Community fields are measured to see how much land each farmer may use for maize production. (Photo by Cristina Chávez-Mejía)

FIGURE 5 Farmers from San Pablo Tlalchichilpa take a rest during a workshop in which they evaluate the success of the agrodiversity project. (Photo by Gabino Nava-Bernal)

that enhance food security and provide new or improved sources of income. These measures also aim at conserving resources.

As an example of activities undertaken with this approach in this participatory project, 10 farmers (5 men and 5 women) out of over 25 participating *campesino* families monitored production on small plots in 2000, in conjunction with the research team. They evaluated associated crops of maize and faba beans, oats and common vetch (for forage for their draught animals and other livestock) and peas, introduced as a frost-resistant horticultural crop that can provide income as well as increase their own food supply. The ten farmers determined which crops to evaluate and how to conduct their trials (sowing dates, areas assigned to their experiments, management, etc.).

Evaluating local experiments

During the evaluation workshop at the end of the cycle in December 2000, participating farmers established their evaluation criteria in relation to 1) production of food for household consumption (peas and faba beans); 2) production of surplus for sale; 3) payment for labor; 4) production of seed for the next cycle; and in the case of common vetch, 5) production of forage for their animals and seed for the next cycle (examples in Table 1). They also identified the main problems that affected their crops and suggested possible ways of overcoming them, or shared experiences with others who were more successful. Besides the 10 farmers who closely monitored their trials, members of the other 15 participating households also attended the workshop, along with 8 farmers from another Mazahua *campesino* village (Figure 5).

The role of the research team at the beginning was to promote discussions of the benefits and drawbacks of associated crops based on their own or other villagers' experiences, and to provide villagers with information on the selected crops. They also assisted in monitoring crop development and encouraging villagers to reflect on their results and what they perceived in the results of other participating households. The team was responsible for recording this information as well as more quantitative data. The flow of information between *campesino* households and the research team was facilitated by several factors. These included the close relationship established between the team and the community, the good results obtained, the strong sense among participating households that they belonged to the project, and the confidence and identity thereby generated in the village.

Overall evaluation of the project by the *campesinos* was not only very positive in terms of production. They also singled out the following advantages:

- Exchange of experience, sharing of information and in-depth discussion of agricultural and economic issues. The participants identified successful farmers who acted as leaders with respect to the particular crops or practices they had done well with.
- Recognition of the need to ensure enough production of seed to continue sowing the crops and, if possible, expand the areas sown; in general, growing awareness of factors ensuring sustainability of cropping systems and livelihoods.
- Discussion of the effect of different soil types on the crops, based on shared

experience of cropping and recovery of traditional knowledge about faba beans, lost by the generation who grew up when extension agencies and credit schemes recommended against associated crops. The failure that one farmer had with his pea plot due to the careless use of herbicides was discussed as an example of the need to recover indigenous knowledge.
- Restoration of self-esteem regarding traditional knowledge and practices.

The willingness of *campesinos* to experiment with the restoration of their abandoned agricultural practices (associated maize–legume crops) and with new crop associations they had not previously managed (vetch and peas) shows that they have a great capacity to adopt agricultural technologies and adjust them to their particular circumstances. The qualitative and nonquantifiable impacts mentioned above (self-esteem, ownership, trust between *campesinos* and researchers, development of a mutual support network, revalorization of traditional knowledge, strengthening of *campesinos'* own investigative skills) are further invaluable benefits of the project.

TABLE 1 Sample of results of the evaluation workshop for 2000 (4 out of 10 cases)

Farmer	Crops	Uses	Problems
Alberto García	Faba beans		Did not flower
	Peas	Household consumption, sale, seed	
	Vetch	Forage, seed	
Cristina Ruíz	Peas	Household consumption, sale, payment for plowing of her land, harvesting, and new hoe; seed	
	Oats	Forage, seed	
Sara García	Faba beans	Household consumption, seed	
	Peas	Household consumption, seed	
	Vetch		Did not grow properly because the oats choked it
Olegario González	Faba beans		No production due to herbicide misuse
	Peas	Household consumption, seed	
	Vetch	Forage	

Conclusion

The achievements of the project in applying this approach can be explained in terms of *what* is researched and *how* research is conducted. The project met farmers' priorities, there was an excellent relationship with the community, work plans were flexible and locally pertinent, and the participation of *campesinos* in the project gave them a sense of ownership, of belonging and of being able to count on the commitment of the research team. Therefore, the innovations proposed produced positive quantitative and qualitative changes in production and in community perceptions, while exchange between *campesinos* and researchers enhanced knowledge on both sides. The community also benefited from gaining insight into different ideas, practices, ways of thinking and lifestyles, at the same time as families shared their own ideas, knowledge and worries. The strengthening of these types of experiences and values, and the empirical evidence presented, are fundamental in understanding and explaining the progress and achievements of this project.

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ACKNOWLEDGMENTS

The support of the United Nations University Project on People, Land Management and Environmental Change (PLEC) in this research is gratefully acknowledged.

FURTHER READING

Brookfield H, Padoch C. 1994. Appreciating agrodiversity. A look at the dynamism and diversity of indigenous farming practices. *Environment* 36.5: 271-289.
Jiménez SL. 1993. Paradigmas de investigación agrícola en México y su relevancia en la época contemporánea. In: de la Fuente J, Ortega R, Sámano M. *500 años de agricultura y agronomía en México*. Chapingo, México: Universidad Autónoma Chapingo, pp 45-63.
Lacki P. 1991. *Desarrollo Agropecuario: De la Dependencia al Protagonismo del Agricultor*. Santiago, Chile: Oficina Regional de la FAO para América Latina y el Caribe.
Rivera HG, Arellano HA, González DL, Arriaga JC, editors. 1997. *Investigación para el desarrollo rural. Diez años de experiencia del Centro de Investigación en Ciencias Agropecuarias*. Toluca, México: Universidad Autónoma del Estado de México.
Uitto IJ, Ono A. 1996. *Population, Land Management and Environmental Change*. UNU Global Environmental Forum IV. Tokyo: United Nations University.