

# **ECONOMICS WITHIN THE PRM**

## **I- A BIT OF HISTORY**

Three periods in time can be recognized in the contribution of economics to CIMMYT Regional Program in Central America and the Caribbean (later the PRM).

**1- Between 1974 to 1986.** During this period the main concern of the Program focus on poverty alleviation among small farmers by increasing productivity in the short run. To achieve this general objective the Program concentrates its effort in developing the on-farm research (OFR) methodology among collaborative NARS in the Region. OFR, a research methodology aimed to obtain short term technological alternatives appropriate to farmers circumstances was therefore the main tool used by the Program to foster farmers productivity.

The main products of the Program were: germplasm, research methods and training. The clientele for these products were National Research Institutions. Fostering farmers productivity was, therefore, not done directly by the Program, but through the collaborative work with National Research Programs.

Priority countries were chosen by two main criteria: poverty and opportunity to institutionalize the OFR method. Haiti and Honduras met the first criterion while Panama was chosen by the opportunity one.

The diffusion of the research OFR methodology was led by the economics but it served as a vehicle for the collaborative work between economics and agronomy and breeding.

**2- From 1987 to 1989.** As time evolves the Program's main research concern shifted to incorporate a longer term perspective. This was a consequence of several factors. i) concerns about natural resources conservation started to raise among the international and national research community, ii) some of the Program's products were "mature" to be transferred to NARS' responsibilities, and iii) important new actors, like the ECC, entered in the OFR arena in the region.

These new developments required a change in the research strategy and operational way of the Program. Institutionalization of the collaborative work between CIMMYT and NARS through the creation of regional networks becomes important.

In summary, this was a transition period with a fundamental change in the research strategy together with a reduction of 50% in the

international economics staff assigned by CIMMYT to the Regional Program. Institutionalization and devolution of responsibilities to NARS begun.

**3- From 1990 to present.** In this current stage, providing appropriate solutions to the conflict between increasing productivity and resource conservation becomes the main mission of the Program. With this much longer research horizon the objective was on providing scientific information to feed applied research. the PRM concentrated its research efforts in strategic agronomic issues with emphasis in long term aspects like soil and water conservation, and nutrient recycling. Identification of economic opportunities for research and of main limitations to the adoption of technological innovations under research by PRM was the main objective of economics research in this stage.

Institutionalization and devolution of responsibilities to NARS was completed at this stage.

## **II- DEVELOPMENT DIFFUSION AND DEVOLUTION OF THE OFR METHODOLOGY.**

Through the collaborative work of CIMMYT and NARSs the OFR methodology was widely spread and adopted through the region in a 10-15 years span. The role of CIMMYT and the PRM was instrumental for this success.

The main outputs from this efforts were i) methodologies- diffused through methodological manuals; ii) training on this methods; and iii) area specific OFR programs.

Again it is possible to recognize three stages in recalling the history of the strategy.

**1- The 70's. Testing the methodology.** During the late 70's early 80's CIMMYT in collaboration with IDIAP conducted an OFR program in the area of Caisan in Panama. This program was a landmark in setting the credibility of the method across the Region. A cost-benefits analysis performed on the Caisan Program showed rates of returns to research investment between 50 and 100 % (Martinez and Sain 1983). The success of the case was well documented and spread it all over the Region and serves as demonstration of the cost efficiency of the methodology to others NARS in the Region.

**2- The 80's. Diffusion of the Method.** The strategy to diffuse the OFR methodology through the Region was based on the implementation of a series of Call System Courses (CSC). A CSC is a training course which occurs in steps or calls which follows the logic of the OFR methodology. The participants are introduced to the major methods of OFR during a seven to eight weeks of course work over approximately one and a half years (Tripp *et al.*, 1990).

During the 80's CIMMYT organized three Regional Courses:

1) Jutiapa, Honduras. 1982-1983. With 23 participants from Honduras, Haiti, Panama, and El Salvador.

2) San Andrés, Panama. 1985-1986. With 25 participants from Panama, Costa Rica, and El Salvador.

3) San Isidro, Costa Rica. 1989-1990. With 22 participants from Costa Rica, Panama, Nicaragua, El Salvador, Honduras, y Guatemala.

Besides the OFR programs implemented in the area were the courses were dictated, an important research program was implemented in the area of Les Cayes, Haiti with important research results and policy implications (Martinez *et al.* 1991).

In addition to the full fledge OFR methodology, the Program emphasized the economic evaluation of technological alternatives in the experimental stage. In a 10 years span more than 700 technicians from all countries in the Region were trained in the economic analysis of experimental results using the well known CIMMYT Economics training manuals.

**3- The 90's. Devolution to NARS.** At the end of the 80's beginning of 90's the European Community started its Project "Programa Regional de Apoyo a la Investigación en Granos Básicos" (PRIAG) aimed to support OFR in basic grains in Central America. OFR methodologies, training and programs were transferred to NARS responsibilities through the ECC Project. For that purposes the Program was instrumental in the formation of a Regional OFR Network. This Network was formed as joint effort between CIMMYT, CIAT and IICA. The San Isidro Regional Call Course and an OFR research project elaborated by CIMMYT, and IICA serves as a basis for the current ECC Project. Later on the OFR Network was subsumed into the PRIAG.

The new challenges to the economic discipline presented by the change in research implied a change in the role that socioeconomists play at regional and national level. This in turn, lead to identification of socioeconomics as a weak link in the research chain in most of NARS in

the Region. As a consequence a joint effort between PRM, CIMMYT, CIAT, COSUDE and later the Ford Foundation resulted in the creation of the Regional Socioeconomics Network (RCSE).

The RCSE served as a vehicle for the devolution of responsibilities to NARS in the training on the Economics Analysis of Experimental Results (discrete case). For example, during 1990 and part of 1991 three of the five courses offered was carried out by the socioeconomic units of El Salvador and Panama.

**In summary**, during a 12 years span the Program in collaboration with NARS developed, diffused, and institutionalized the OFR methodology across the Region. As a result CIMMYT and the PRM are widely recognized in the region as ones of the main precursors and supporters of this research methodology. More than 70 technicians have been trained in the Call Courses and at least 5 OFR programs (some with high success in terms of generation and adoption of new, appropriate technology) have succeeded as a direct consequence of these Courses. Manuals and teaching aids are circulating in the agricultural research circles and a high demand still exists for them.

More than 700 national researcher have been trained in the economic analysis of experimental results and the Program has made a significant contribution to the formation and functioning of networking within the Region.

### **3- THE ECONOMIC EVALUATION OF SUSTAINABLE TECHNOLOGICAL ALTERNATIVES**

The new research agenda of economics within the PRM has two main aspects: the **ex-ante** and **ex-post** economics evaluation of and implications for research and policy analysis. The main objective of the agenda is: to evaluate technological alternatives for improving maize productivity while conserving nutrient, soil and water resources in maize-based cropping systems (MBCS) in Central America and the Caribbean.

The objective ex-ante economic evaluation is to increase the efficiency of the process of technology generation and transfer by assessing the economic feasibility of new technological alternatives. While the ex-post economic evaluation attempts to increase the efficiency of the process of technology generation and transfer by assessing the adoption and the economic impacts of disseminated technological alternatives. Table 1 illustrates the main lines of economics research within the PRM.

Training efforts and development of new shifted to address the new challenges presented by the new research agenda: economic analysis of long term experimentation, continuous analysis, risk considerations, and simulation analysis.

Table 1. Economics research in Central America and Caribbean region  
1993 - 1994

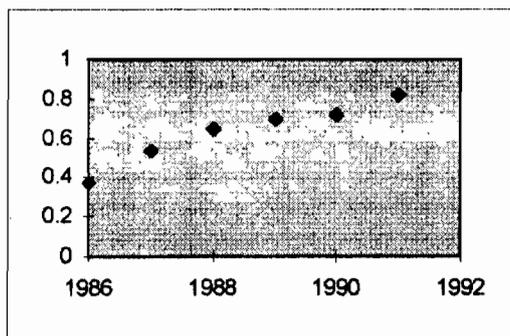
<b>STRATEGIC RESEARCH</b>	<b>Ex-ante economic evaluation</b>	Nutrient conservation and recycling	<ul style="list-style-type: none"> <li>• Maize-legume intercropping [1]</li> <li>• N-fertilizer substitution [2]</li> </ul>
		Soil water conservation	<ul style="list-style-type: none"> <li>• Economic feasibility of conservation tillage in MBCS. [3]</li> </ul>
	<b>Ex-Post economic evaluation</b>	Nutrient conservation and recycling	<ul style="list-style-type: none"> <li>• Innovation and technology adoption of Mucuna in Honduras. [4]</li> </ul>
		Soil water conservation	<ul style="list-style-type: none"> <li>• Adoption of conservation tillage in Guaymango, El Salvador. [5]</li> </ul>
<b>CROP MANAGEMENT RESEARCH</b>	<b>Ex-ante economic evaluation</b>	Institutional strengthening	<ul style="list-style-type: none"> <li>• Transferred to NARS through PRM and SEN. [6].</li> </ul>
		Agronomic practices	<ul style="list-style-type: none"> <li>• Technological change and OFR in: i)Atlantida, Honduras.ii)San Andrés Panamá, Iii)San Isidro, Costa Rica. [7].</li> </ul>
	<b>evaluation</b>	Improved varieties	<ul style="list-style-type: none"> <li>• Adoption of stunt tolerant varieties in Region IV, Nicaragua. [8].</li> </ul>

Table 1 (Cont.)

<b>INSTITUTIONAL STRENGTHENING</b>	<b>Methodological development</b>	<ul style="list-style-type: none"> <li>• Economic analysis more than one period [9]</li> <li>• Adoption and impact of conservation technologies</li> </ul>
	<b>Training</b>	<ul style="list-style-type: none"> <li>• New methodologies [10]</li> </ul>
	<b>Institutional building</b>	<ul style="list-style-type: none"> <li>• Institutionalization PRM [11]</li> <li>• Institutionalization SEN</li> </ul>
	<b>Institutional linkages</b>	<ul style="list-style-type: none"> <li>• PRRIAG, CATE, CONSORTIUM, INCAE, GTZ [12]</li> </ul>

**BOX xx. Adoption of stunt tolerant maize varieties in Nicaragua.**

Although the first attack of corn stunt was first reported in Nicaragua as early as 1965 was not until early 70's that the disease becomes economically important. In 1974 the national programs of Nicaragua, El Salvador and Mexico with the support of CIMMYT started collaborative efforts aimed to obtain stunt tolerant breeding materials. Varieties NB-6 and NB-12 are the results of years of collaborative research effort. Variety NB-6 was released in 1984 while NB-12 was released in 1987. An adoption study conducted in 1991, showed that about 80 percent of farmers in the Region IV of Nicaragua has adopted improved varieties tolerant to corn stunt (NB-6 or NB-12). This adoption level represents more than 12,000 hectares of maize and estimated annual net benefits for farmers in the region in the order of 1.2 million dollars (Sain and Borbon, 1993).



1986	0.375
1987	0.534
1988	0.648
1989	0.697
1990	0.716
1991	0.820

The PRM through its socioeconomics unit has finished a similar study in the Region II of Nicaragua. Preliminary analysis of the data shows comparable rates of adoption among farmers in this Region. Results from both studies will allow to extract general conclusions about economic impact, farmers preferences, and policy and research implications regarding this particular technology.

## **BOX yy. Adoption of sustainable technological alternatives.**

### **i) Zero tillage in El Salvador and Panama**

Adoption of conservation tillage in the area of Metalío-Guaymango occurred during the 70's and early 80's as a consequence of a confluence of several institutional, economic and technical factors (Calderon *et al.* 1991). Diffusion of a highly productive set of technique was a necessary condition for the success of the rapid diffusion pattern which characterized the phenomenon (Sain and Barreto, 1994). This set of technological innovations (hybrids seed, fertilizer and herbicides) was partially a consequence of the first stages of the collaboration efforts between CIMMYT and NARS in Central America.

In 1985-86 IDIAP with the collaboration of the PRM launched an OFR program in the area of San Andrés, in the Province of Chiriquí, Panamá. In 1993 the PRM, through its socioeconomics unit conducted an adoption study in order to evaluate the level of adoption of the new technologies generated by the Program. Preliminary results show high adoption levels of the five main technological components diffused by the Program: land preparation, variety, spatial arrangement, nitrogen fertilization and weed control. In the particular case of land preparation, about 95 percent of the farmers in the area are carrying out a conservation practice.

### **ii) Aboneras en el Litoral Atlantico de Honduras.**

In the Northern Coast of Honduras, there are two systems or patterns of maize production: 1) The "*traditional*" system, where the farmer plants maize on an individual parcel of land in the *primera* cycle and again in the *postrera* cycle. Summer maize is grown again in the following cycle. After that, the plot is left fallow for about four years, and, 2) The "*abonera*" system. At the start of the *postrera* cycle, farmers sow maize on a parcel of land. About 40-55 days after sowing maize, farmers seed mucuna (called *frijol de abono*, or "fertilizer bean" by farmers), among the maize plants. The maize is harvested between March and April and the mucuna remains in the plot until the next *postrera* maize sowing season. Before sowing their *postrera* maize, farmers slash the mucuna, leaving the mucuna plants on the field to form a mulch into which maize is seeded directly

A study conducted in conjunction by CIMMYT, the SRN of Honduras and the PRM during 1991 and 1992, found that the *abonera* system was transferred to the area from Guatemala by migrants farmers in the early 1970's. Since then it spread from farmer to farmer to most of the communities in Atlántida. The *abonera* system spread slowly the first

ten years after introduction but started to grow at a high rate during the 1980's. Currently is estimated that between 65 and 70% of the hillside farmers in the Department of Atlántida in Northern Honduras grow "winter" maize under the "abonera" system using Mucuna (Mucuna Deeringianum) (Buckles *et al.*, 1992).

Although adoption occurred mainly between farmers who has access to the land in a more or less permanent basis there are other factors identified to be important in the farmers decision to adopt the system. Topography of the maize plot, and farm size were found to be significant and positively associated to the likelihood of adoption of the system. While factors like nitrogen fertilization, and proportion of total land in fallow were negatively associated to the probability of adoption (Sain and Buckles 1994).

**BOX zz. Economic evaluation of legumes intercropping systems.**

Results from El Salvador (years 1991 - 1992) and Guatemala years (1989 - 1990, and 1990 - 1991) show that when legumes are sown at the same time that maize the value of maize yield reduction is larger than the value of next cycle yield gain due to residual effects plus the cost reduction in weed control. These results are dependent of the grain value of the legume. In particular, if a farm level market develops for Vigna, the intercropping of maize with this legume becomes profitable. (Choto de Cerna *et al.*, 1993; Valladares and Sain 1993.).

The abonera system a farmer practice in Northern Honduras for growing winter maize shows a high profitability relative to traditional land uses in a 6 years cropping cycle. The system however does not substitute for the traditional one but it is used by farmers to increase maize grown in the winter cycle when water is scarce (Sain *et al.*, 1993).