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Daniel Galt
Davis, California
April, 1982

PREFACE

Now that farming systems research (FSR) in the Third World is five years old, it's time to take stock of attempts to move FSR from the International Agricultural Research Centers to national agricultural research systems. Although the International Agricultural Research Centers have made important contributions to FSR methodology, it is well known that researchers in these centers enjoy a measure of financial support which is seldom matched by researchers in national agricultural research systems.

The Department of Agricultural Economics at Michigan State University has requested several FSR research teams to document their experience and the problems encountered in introducing FSR in national Agricultural Research Systems. This paper by Dan Galt et al. presents an assessment of the problems and the achievements in introducing FSR in the national agricultural research system in Honduras. Papers on introducing FSR in Thailand, the Philippines, and Indonesia are in preparation and will be published in 1983.

Carl K. Eicher
Professor of Agricultural Economics

ACRONYMS

BID	Interamerican Development Bank
BNF	National Development Bank
CATIE	Agricultural Center of Technology and Education (Costa Rica)
CIAT	International Center for Tropical Agriculture (Colombia)
CIID	Canadian Institute of International Development
CIMMYT	International Center for Corn and Wheat Improvement (Mexico)
CIP	International Center for Potatoes (Peru)
CU	Central Unit (of PNIA FSR, Honduras)
CURLA	University Center of the Litoral Atlantic Region (La Ceiba, Honduras)
DESAGRO	General Directorate of Agricultural Development
DESARRURAL	Cooperative Service for Rural Development
DGOA	General Directorate of Agricultural Operations
EAP	Panamerican Agricultural School (Zamorano, Honduras)
ENA	National Agricultural School (Olancho, Honduras)
EVT	Experimental Variety Trial (CIMMYT)
FAO	Food and Agriculture Organization (United Nations)
FSR	Farm Systems Research
IADS	International Agricultural Development Service
IBRD	International Bank for Reconstruction and Development (World Bank)
ICTA	Institute of Agricultural Science and Technology (Guatemala)
IDA	International Development Asociation (IBRD)
IDRC	International Development Research Council (Canada)
IICA	Interamerican Institute of Agricultural Sciences (South and Central America)
INA	National Agrarian Reform
IPTT	International Progeny Testing Trial (CIMMYT)
OICD	Office of International Cooperation and Development (USDA)
PNIA	National Agricultural Research Program
PROMYF(SA)	Corn and Bean Project
SRN(MRN)	Ministry of Natural Resources
STICA	Interamerican Technical Service for Agricultural Cooperation
USAID(AID)	United States Agency for International Development
USDA	United State Department of Agriculture

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I. HISTORY OF AGRICULTURAL RESEARCH IN HONDURAS

Introduction

An important date in the origin of the idea for multidisciplinary on-farm research in Honduras (hereafter referred to as farming systems research, or FSR) is September, 1976. During this month, a group of Cornell/CIMMYT/Rockefeller Foundation multidisciplinary graduate students[1] met in San Miguel de Allende, Mexico, to produce a final team report.[2] At one of the sessions, Mario Contreras explained his new job in agricultural research with the National Program of Agricultural Research (PNIA) in the Ministry of Natural Resources (SRN) of Honduras. In the SRN, disenchantment with traditional research had led to plans to establish a multidisciplinary research group to help implement a reorganization of agricultural research. As Contreras described plans in Honduras, several other team members expressed their interest in continuing interdisciplinary research together after the completion of their graduate training.

Interviews were arranged by Contreras between the interested team members and Honduran officials in the SRN. During these interviews, the students and the representatives of the SRN reached a general philosophical agreement concerning the multidisciplinary, on-farm research focus needed in Honduras. In March, 1977, Contreras arranged to offer formal contracts to the three team members who had been interviewed in Honduras. Peairs and Galt accepted their contract offers and, when Rodriguez accepted another position, his contract was offered to, and accepted by, Joshua Posner.[3]

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[1]The student research team was composed of six Cornell Ph.D. candidates, representing six agricultural science disciplines. The students were: 1) Mario Contreras, pathologist from Honduras; 2) Daniel Galt, agricultural economist from the USA; 3) Samuel Muchena, plant breeder from Zimbabwe-Rhodesia; 4) Khalid Nor, biometrician/statistician from Malaysia; 5) Frank Peairs, entomologist from the USA; and 6) Mario Rodriguez, agronomist from Colombia. Each student spent approximately 18 months--three cropping cycles--in Mexico conducting thesis research on tropical and semi-tropical corn cultivars under the auspices of Cornell, CIMMYT (International Center for Corn and Wheat Improvement) and the Rockefeller Foundation. The research effort was interdisciplinary, with frequent team meetings to trade ideas and problems and to discuss individual and collaborative research field trials.

[2]Contreras, M. R., et al., "An Interdisciplinary Approach to International Agricultural Training: The Cornell-CIMMYT Graduate Student Team Report." Cornell International Mimeograph 59, Dec. 1977. See also Whyte, William F., Participating Approaches to Agricultural Research and Development: A State-of-the-Art Paper, ARE No. 1. Ithaca, New York: Rural Development Center, Cornell University. May 1981.

[3]Posner is an American agronomist who, in early 1977, had five years of experience in western African agriculture and was scheduled to complete his Ph.D. requirements at Cornell at about the same time as the rest of the team members.

Background of Agricultural Research Policy

In 1976, the Minister and Vice-Minister of the SRN agreed that the traditional research-extension model was not working effectively in Honduras. Since 1966, per hectare yields of the basic grains in Honduras have either been stable or falling. Honduras has gone from being a major net exporter of corn and beans in Central America to a heavy importer of corn and a marginal importer of beans by 1980-81. Imports of corn have been considerable since 1975, averaging slightly less than 23,000 metric tons per year. During this six-year period, total metric tons of the four basic grains imported averaged 27,285 per year. Only sorghum was a net marginal export at 1,327 metric tons per year.

Table 1 documents the Honduran government's targets of production for the four basic grains in 1978, and the actual, estimated and forecast production levels of these grains from 1978 to 1981. With the exception of rice, production levels were considerably lower than target levels. Since production levels of corn, rice and sorghum have dropped, while that of beans has risen only slightly since 1978, the gaps between government production targets and actual production of these grains have widened. Moreover, between 1966 and 1980, the Honduran general price index has risen 232%, and general food prices have increased 257% (USAID, 1981). More hillsides and other marginal lands have been coming under cultivation to keep pace with demand, as productivity has not.

These problems were addressed by both the SRN and the national 5-year plan (1978-82). The national plan stressed (1) increased research on the small- to medium-sized farmers in the independent and reformed sectors, a group which produces the majority of the basic grains (corn, beans, rice and sorghum);[1] and (2) continued research emphasis on basic grains with the medium-to long-range emphasis gradually shifting to vegetables, oilseed crops, and livestock as grain output increased (IADS, 1978).

Farms in the 5-35 hectare size are estimated to sell about 50% of their basic grains to feed other sectors of the population, while farmers operating less than 5 hectares sell approximately 25-33% of their production (USAID, 1981). Thus, the dual national goals of helping the majority of both rural and urban poor can be met by placing increased emphasis on research for small- to medium-sized farmers.

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[1]Farms of 0-20 hectares make up 88% of total Honduran production units, but only 27% of the farming acreage. This same group of farms produces 69% of the corn, 72% of the beans, 55% of the rice, and 77% of the sorghum in Honduras (Agricultural Census of Honduras, 1974). In terms of all cultivated crop area in Honduras, corn covers 50.6%, beans 10.6%, sorghum 8.7% and rice 2.3%. These four basic grains together account for 72.2% of all cultivated crop area (Compendio Agropecuario, 1977).

Table 1. Government Grain Production Targets for 1978 and Production Estimates, 1978-81

	Production (1,000 Metric Tons)				
	1978		1979	1980	1981
	Target	Actual	Actual	Estimate	Forecast
Corn	472	417	343	358	400
Rice	30	32	32	26	27
Beans	56.2	35	38	38	42
Sorghum	55.9	42	37	34	36

Source: USAID. 1981. "Evaluation Team Report." Evaluation of USAID Honduras Agricultural Research Project No. 522-0139 with The National Agricultural Research Program (Preliminary Draft, 5/29/81).

The FSR Team and Its Objectives

The Ministry of Natural Resources (SRN) recruited a multidisciplinary research group--a Farming Systems Team--to help carry out a reorganization of agricultural research. The Farming Systems Team consisted of six scientists: (1) a Honduran plant pathologist who led the effort to reorganize the agricultural research system; (2) a Honduran plant breeder who headed the implementing and support unit in the field (known as the FSR Central Unit, or CU); (3) an entomologist from the U.S.; (4) a forage breeder from Uruguay who coordinated training; (5) an agricultural economist from the U.S.; and (6) an agronomist from the U.S. Each contract was concluded directly between the individual researcher and the Government of Honduras, and covered a period of one year. It was generally understood that the moral commitment from each side would be for a five-year period to allow for continuity, implementation of research reorganization, and sufficient time for on-farm research to begin to demonstrate some advantages over traditional research.

The FSR Team identified four strategies to implement the reorganized agricultural research system. They included:

(1) farmer-oriented, inter-disciplinary research;

(2) strengthening of the national research station network;

(3) manpower development program; and

(4) exploitation of opportunities to link with other agricultural research and development institutions engaged in activities complementary to those of PNIA (IADS, 1978).

Farming Systems Research (FSR) was viewed as the methodology which would complement traditional on-station research and be useful in discovering the constraints on small farmer production at the farm level.

From the viewpoint of the SRN, the advantages of FSR were:

(1) researchers having first-hand familiarity with farmer's conditions and problems;

(2) productivity constraints could be resolved regionally through an interchange between the experiment station and farmers;

(3) integration of socio-economic considerations into agricultural research and development to avoid recommendation of technologies with little chance of successful adoption by farmers;

(4) increased confidence in long-run research planning (e.g., the need for soil conservation experiments) and early warning of new problems (e.g., the increasing incidence of sorghum downy mildrew, Sclerospora sorgi); and

(5) the generation of improved linkages between extension and research.

The Administrative Organization of PNIA

Agricultural research in Honduras has progressed, since the 1950s, from the Inter-American Technical Service for Agricultural Cooperation (STICA), through the Cooperative Service for Rural Development (DESARRURAL) which was included initially (in 1974) in the newly-formed Directorate General of Agricultural Development (DESAGRO), finally into PNIA in the General Directorate of Agricultural Operations (DGOA).

A partial flow diagram of the structure of the Ministry of Natural Resources (SRN) necessary for historical background is presented as Figure 1. Three levels of decision-making affect research: 1) Ministerial, 2) National Programs in the DGOA and the decentralized Regional Directors, and 3) The Regional Research Coordinators.

Institutionally, a major problem that was recognized from the outset of the FSR effort was that both the DGOA and the regional directors were at the same administrative level and that PNIA leadership did not have full control over its regional research personnel:

> The operation of PNIA as a national entity is complicated by the MRN organizational and administrative structure. The head of PNIA has limited authority to implement approved programs because he does not control regional expenditures of PNIA's budget. The Regional Directors control these, and thus can name and manage research personnel, including their travel both within and outside their region. This makes it impossible to have a strong coordinated national research program. Further complicating the issue, is that the different regional directors control the regional research budgets to various degrees. (IADS, 1978)

This difference between technical and administrative linkages and, thus, loyalities (the former national and the latter regional) of research staff, was never fully resolved.

II. ORGANIZING FSR IN HONDURAS

Restructuring PNIA

The FSR research unit was originally located in Tegucigalpa, the capital. An IADS mission assisted the FSR unit in preparing a basic document (IADS, 1978) outlining the reorganization of research in PNIA. The document provided the justification, objectives, goals, budgets, and manpower needs to implement FSR in Honduras from 1978-83. The IADS report considered three basic sources of funding to implement FSR: (1) Honduran SRN budget appropriations for agricultural research, (2) a USAID Grant earmarked for reorganization and strengthening of PNIA, and (3) an IBRD/IDA Loan to also assist in reorganization and strengthening PNIA.[1] The IADS Report formed the basis of a subsequent USAID Project Paper, the result of which was a grant of approximately $1.9 million to the Government of Honduras, administered through PNIA. Together with the expected IDA loan, which was to be approximately $2.0 million, a total of $3.9 million in external funds was available to the SRN to assist in funding the reorganization of PNIA research through 1983.

To instill a more national approach to research focused on the basic grains at the farm level, a change in the research organization was proposed for 1978. This reorganization consisted of three levels: (1) the national headquarters in Tegucigalpa; (2) the Central Unit (CU) for FSR methodology development and training; and (3) the regional units.

PNIA National Headquarters

The headquarters was to contain the head of research and an administrative assistant. This small unit was to:

(1) represent research at the national level;
(2) assume overall responsibility for achievement of program objectives;
(3) coordinate other domestic and foreign institutions and organizations with agricultural research interests in Honduras;
(4) give ultimate decisions and supervision on research activities; and
(5) provide administrative and other support services (IADS, 1978).

A key to the reorganization would have provided the head of research with control of budget and personnel so that regional research expenditures and personnel changes would require PNIA approval.

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[1] These funds were not provided solely for FSR. There were also appropriations to build up the experiment stations and crop commodity projects so that they could better backstop the future FSR teams.

FSR Central Unit (CU)

The FSR Central Unit (CU), located from 1978-1980 in Comayagua, consisted of technical experts brought together to develop the FSR methodology for Honduras and provide training for a critical mass of Honduran agronomists in FSR research. The CU was located at the research station in Comayagua, to allow the CU team members to conduct both farm and station research. The original goals of the CU were to:

(1) develop and implement FSR methodology for use in the regional units;
(2) provide in-service training in FSR;
(3) conduct research to support regional research efforts;
(4) coordinate and supervise PNIA research on a national basis; and
(5) provide technical assessment of PNIA research (IADS, 1978).

FSR Regional Units

The multidisciplinary regional FSR teams were the cornerstones of Honduran FSR. One regional unit would be trained by the CU each year, and eventually at least one team would be located in each of the seven administrative regions. Flexibility of composition was stressed, so that the disciplinary make-up of a given team could reflect regional priorities. The regional FSR teams were to:

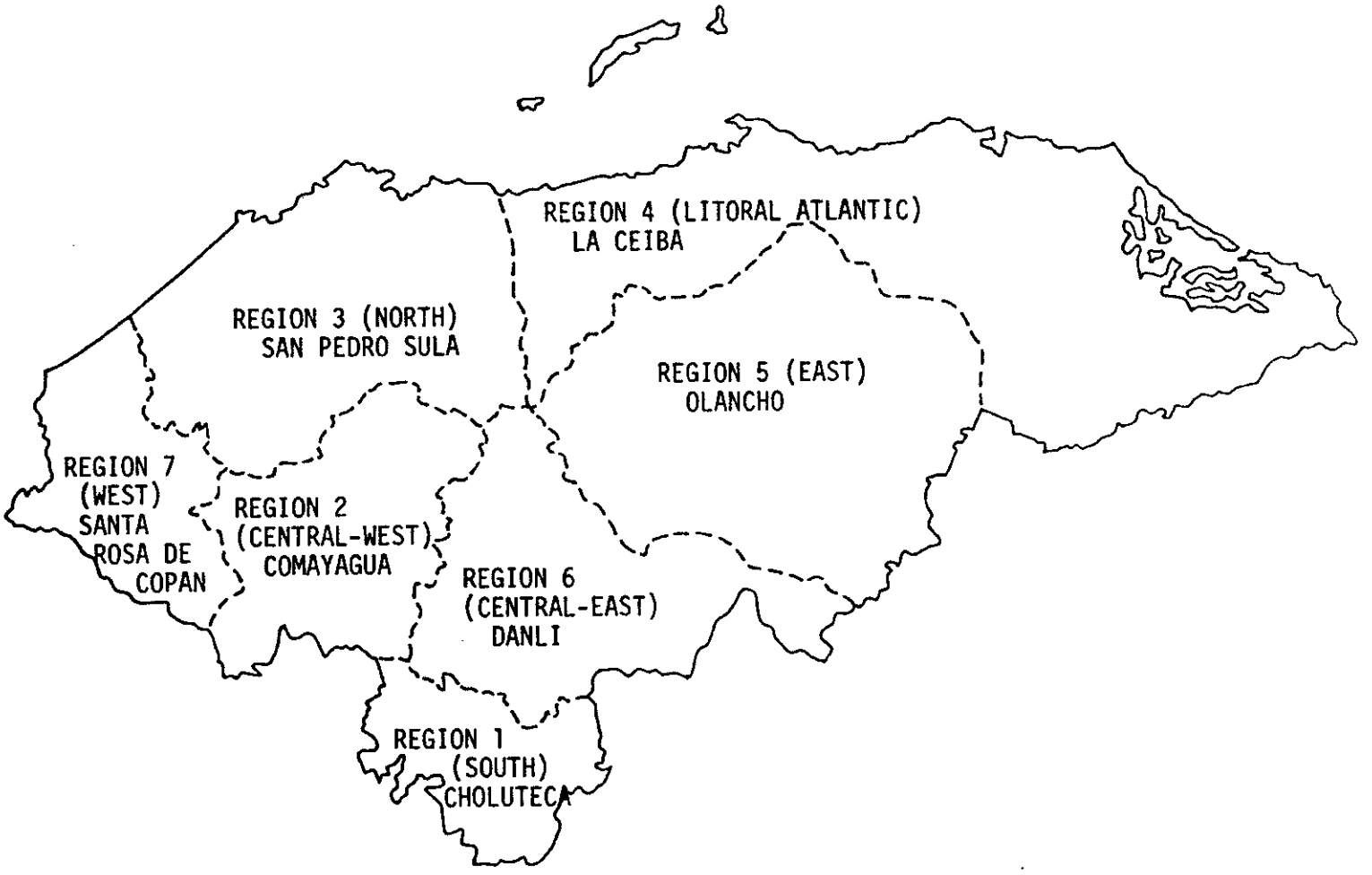
(1) identify target farmer groups through surveys;
(2) collect agro-economic information on the predominant farming system(s) of a homogeneous area;
(3) identify production constraints;
(4) introduce improvements in farming systems; and
(5) document farmer acceptance of improved systems (IADS, 1978).

FSR Organization in Honduras

The FSR team met ten times between August and the arrival of the IADS assessment team in October of 1977. Some of the ideas and concepts which emerged from these discussions were incorporated into the document, "Agricultural Research in Honduras" (IADS, 1978). Regions 1, 3 and 6 were visited in August and September, and the reorganization proposals were presented to local PNIA staff. During October, the IADS mission arrived, and similar trips were also made to regions 1, 2, 5 and 6 (see Figure 1).

At this time, the first disagreements surfaced between the relationship of existing research activities and the newly-proposed FSR activities. The debate between commodity program research and FSR continues today. The existing head of PNIA and one plant breeder objected to FSR on the grounds that it would take too much power away from crop projects and concentrate it in the new Central Unit. The difference in opinion centered on the decision to refocus research on existing conditions of the Honduran farmer. The reorganizers of research insisted on a farm-oriented research program, with the greatest concentration of manpower at the regional level.

FIGURE 1: ADMINISTRATIVE REGIONS OF HONDURAS



Creation of the FS Central Unit (CU)

The location of the CU was a major topic of discussion among different authorities in the Ministry, members of the Program and other advisors. Three locations were considered: (1) Region 7, the region of greatest poverty; (2) Region 3, a region of high agricultural potential, close proximity to Regions 7 and 4 and a major city conducive to family life; and (3) Region 2, a region close to the capital, georaphically near the center of the country and possessing the necessary research infrastructure. Several international experts recommended that the CU be located in the headquarters (in Tegucigalpa). Since SRN policy at the time was to promote regionalization by discouraging the addition of agricultural research staff to Tegucigalpa, Region 2--Comayagua--was selected for location of the Farming Systems CU.

Comayagua is 80 kms from Tegucigalpa by paved highway, has enough building space, an adjacent experiment station, and has a wide range of different environments and associated farming systems. In time, even though Tegucigalpa and Comayagua are relatively near one another and telephone services are fairly good, communication proved to be less efficient than required between the CU and headquarters. Thus, too much stress can be placed on regionalization. The FSR implementing unit should be located physically with those decision-makers responsible for guiding the methodological development of FSR and obtaining long-term financing for such methodology. Shortly after agreement on the location of the CU was reached, a Honduran plant breeder was nominated to head this unit.[1] All researchers agreed that a Honduran should also lead the field FSR effort.

Duties of CU Staff

General Responsibilities

Once it began operations in Comayagua, the FSR staff in the CU had to develop the on-farm research methodology, adapting their activities to the prevailing and perceived institutional framework of the Program. The researchers in the CU also had to lend technical assistance to researchers in different regions of the country, and participate actively in training incoming and present research personnel. Furthermore, the CU had to lend support to the Headquarters in policy development and implementation, project analyses, coordination with external groups and exploration of new research opportunities.

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[1]Up to this time, all researchers were assigned crop coordinating responsibilities. Upon appointment as head of the CU, the new head was relieved of these responsibilities to allow him more time to concentrate on initial CU coordinating duties.

The FSR core group comprising the CU was made up mostly of expatriates. The professionals divided work mainly along disciplinary lines. However, strong interdisciplinary interactions characterized working relations. All researchers were expected to conduct field work themselves. The CU made a conscious decision that everyone in the unit would get hands-on experience while learning to set out farm trials. The CU was also expected to integrate the Comayagua station into their research plans. Thus, a replicate of each trial was included on-station from the beginning.

The work schedule of the CU researchers included periodic visits to the different regions to give technical assistance to regional PNIA staff. While this worked after a fashion, certain regions were much more open to interaction and exchange of ideas than were others.

While regional and commodity responsibilities were evolving, additional duties for the CU members were those of traditional disciplinary expertise. For example, in addition to his responsibility for Regions 5 and 6 and beans, the entomologist had national responsibility for entomology. Thus, most CU researchers had responsibilities for regions, commodities and disciplines. It soon became apparent that this arrangement spread expertise too thin and required too much time, but a satisfactory solution to this dilemma was never attained.

Integration of Other Researchers Into the CU

The CU sought to prepare young Honduran agronomists to undertake FSR. The CU evolved from a small core group in 1977 (made up of a plant breeder, entomologist, economist, and two agronomists) to a unit composed of several discipline specialists, an in-service training group, an animal science research group and intermediate technology project staff by 1979. Expatriates assigned to PNIA under different institutional arrangements were incorporated into the CU. This mechanism integrated personnel from various externally funded projects into a central support group. The integration of expatriates working under some international contracts encountered some interinstitutional friction. Usually when this occurred, these institutions had preconceived roles for their professionals. Integration within PNIA required compromises that were at least partially acceptable to PNIA leadership.

Crystallization of CU Research Priorities

After one year of field implementation, the CU met and decided on the following research priorities:

(1) Assistance to, and presence in, the regions

To provide this assistance most efficiently, Regions 2, 4, 5 and 6 were given priority. Reduced emphasis was given Regions 1, 3 and 7.

(2) Verification of technology (of PROMYFSA)

At this time, PROMYF (the Corn and Bean Project) was incorporated into the Ministry under the DGOA (General Directorate of Agricultural Operations). PNIA, and subsequently the CU, was assigned to provide technical assistance to PROMYFSA technology verification units.[1]

(3) Training

This phase of FSR retained its high priority.

(4) Documentation of FSR Methodology

This was one phase of FSR which was never satisfactorily completed.[2]

History of the CU

Frequent group meetings characterized the operation of the CU during 1978. Monday meetings in Tegucigalpa gave way to Friday meetings in Comayagua. All CU researchers were expected to attend such weekly planning meetings, unless busy with field trials. Travel and work plans for the following week were discussed, as was distribution of work vehicles. In addition to administrative matters, these meetings provided an open forum for discussion of FSR methodology, planning of seasonal work loads and trials, and reflection on, and analysis of, the general direction of the FSR focus. Also, discussions involved relations between PNIA and other programs, such as extension, human resources, and sector planning.

In addition to the regular Comayagua meetings, sub-groups of CU researchers made frequent regional visits to promote FSR methodology. This was one of the drawbacks of the operation of the CU: many more ideas were generated than could be implemented, and, in addition, too much time was spent in trying to introduce FSR into regions lacking even the minimum institutional conditions to launch FSR.

One constant and partially deserved criticism of the CU researchers was that they did not spend enough time interacting with other PNIA rsearchers. Such interactions could have been facilitated by: (1) relocation of some heads of commodity projects in Comayagua; (2) the nomination of counterparts who could have worked closely with each

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[1] Incorporation of PROMYF into the Ministry was not accomplished without considerable controversy over FSR methodology. This controversy still surfaces today among different PNIA researchers.

[2] The FSR manual prepared by the CU contains a detailed list of procedures and observations which should have been followed or taken (SRN/PNIA/Unidad Central, 1978). However, time limitations meant that some of the agreed-upon routine procedures (e.g., soil samples and subsequent analyses) or observations (e.g., plant densities) were not taken at each farm site. Documentation of the FSR practices actually carried out was never completed.

Farming Systems Researcher in the CU; and (3) regular in-service training sessions. Of these, only the third item was realized.

The joint meetings between the CU staff and the regular PNIA Comayagua researchers were a waste of time. It would have been much more efficient to have been able to maintain liaison with PNIA technicians with open attitudes toward the FSR philosophy. However, PNIA leadership had neither the inclination nor the power to implement FSR without agreement from regional directors and crop commodity specialists. Only greater force from the Head of PNIA on up through the director of DGOA, including the Minister, would have added the necessary power to accomplish the administrative changes to implement FSR more smoothly.

The new research areas or disciplines, such as animal science and intermediate technology, were relatively easy to integrate into the CU as they had played no traditional role in PNIA. Integrating crop specialists was never accomplished, with the exception of early corn and sorghum. There were several reasons for this. One was the reluctance of regional directors to let qualified personnel move to Comayagua. Another was outright opposition of the older heads of commodity research programs to support the FSR effort in Comayagua. Thus, in 1979-80, the heads of the maize, rice, and bean projects participated very little in CU activities. It should be recalled that the original FSR focus in Honduras was precisely on these basic grains.

By early 1981, the influence of the CU support unit had been significantly reduced in size. There was a large staff turnover as personnel were removed or reassigned. The in-service training activity was cancelled for a number of reasons, including the lack of personnel to carry out the training and the philosophical incompatibility of DGOA leadership with on-farm research as represented by the CU. The May 1981 evaluation of the PNIA program recommended that the CU be revitalized and that every effort be made to continue some form of the in-service FSR training program (USAID, 1981).

Summary of FSR Organization

When FSR is added to an existing on-station research system, it will not automatically be welcomed with open arms. Some opposition is to be expected from those already established in the agricultural research system. Those introducing FSR should remember that FSR: (1) has to prove itself anew in any given country or region; (2) may take resources away from on-going research (e.g., breeding or variety trials on experiment stations); and (3) has start-up costs which have to be justified (e.g., large recurrent budget for petrol). In addition, those initiating FSR may have to deal with some of the following issues:

(1) How will the newly-formed FSR units interact with established researchers?

(2) Where will the FSR central support unit be located, and will its training function cover all regions?

(3) How long should a training session last?

(4) Who should be trained (agronomists, M.S. candidates, social scientists, etc.)?

(5) Should the FSR trained technicians be located in a single region as a regional team upon successful completion of FSR training, or should they be assigned individually to regions based on need or other criteria?

(6) Will the host country government be able to incorporate training costs into its regular annual budget to provide continuity through time? and

(7) Is the proposed FSR methodology suited to the political, economic, and institutional constraints of the host country?

III. DEVELOPMENT AND IMPLEMENTATION OF FSR

Introduction

The approach to FSR and the methods of implementation have evolved considerably since 1978. In this chapter we document important elements of the methodology and its evolution. Table 2 presents an outline of the key stages in the methodology as it was developed in 1978 and those stages being practiced in 1980. The reader will be referred to this table throughout the chapter, which has four major sections. Section one examines the procedures used in selecting regions, farmers and specific problems to be included in on-farm and on-station trials. Section two considers the experiences of implementing farm trials and farm record keeping systems. Section three analyzes the results and efforts to extend FSR to other regions of the country. The final section discusses training of Honduran researchers.

Selecting Regions and Farmers, and Design of Farm Trials

Regional Reconnaissance **(Sondeo)**

Field work in FSR began in January, 1978 as CU sub-groups visited the Camayagua region and farmers in various zones. We selected zones based on political boundaries, using the municipality as the basic unit. This had the advantage of giving our study zones meaningful governmental boundaries, a base in census data, and coincided with the mandates of other governmental agencies (especially extension).

During February and part of March, the FS economist collected census ownership lists and corresponding parcel maps for those municipalities covered by the National Agrarian Reform (INA) census of 1974. The agronomist collected available information on soils and rainfall for the Comayagua valley.

The system of reconnaissance used by the CU was to interview informally one to five farmers, either in their fields or their homes, in groups of two to three researchers (Table 2). Interviews lasted approximately one-half hour. Their purpose was to identify the predominant crop systems, and the spatial relationships of crops within the system. Drawing a simple map in the dirt as the interview progressed was the best way to obtain specific agronomic information, such as the distance between rows and hills. This phase lasted one month. However, the CU had only one work vehicle assigned to it at this time, meaning that farmers from only one zone could be visited at any given time.

After members of the FSR CU team wrote up trip chronicles of the reconnaissance surveys, the CU met and decided to interview farmers in four zones: (1) La Paz, La Paz Department; (2) Flores; (3) El Rosario; and (4) San Jeronimo, all of Comayagua

Table 2. Evolution of Honduran FSR Methodology, 1978-80

FSR Cropping Season Phases	
1978	1980
1. Informal Reconnaissance Survey	1. Formal Reconnaissance Survey
2. Formal Diagnostic Survey	
3. Farm Trials: a. Planning and Design b. Selection of Collaborators c. Installation of Trials d. Observation and Management e. Harvest	2. Farm Trials: a. Planning and Design b. Selection of Collaborators c. Installation of Trials d. Observation and Management e. Harvest
4. Installation of Farm Records	
5. Analysis of: a. Farm Trials b. Farm Records	3. Analysis of Farm Trials
6. Presentation of Results: a. To Other Researchers b. To Farmers c. Selection of Repeat Treatments	4. Presentation of Results: a. To Other Researchers b. To Farmers c. Selection of Repeat Treatments

Department. These zones differed in agro-climatic characteristics, predominant cropping systems and cropping potential (see Table 3).

Zones

The following zones were considered for farm trials in 1978-79. Flores was ultimately rejected, while the other three were selected.

Flores

Located some 15 km south of Comayagua, with abundant irrigation, Flores had the greatest potential for both system changes and yield increases of existing systems. This zone was rejected because: (1) the number of different cropping systems was very large (25 systems were identified on the 28 farms surveyed) and selecting the dominant ones would have been difficult; and (2) it was the first zone to be planted each season, and the CU realized there would not be enough time to design proper farm trials for the zone.

La Paz

Located approximately 12 km west of Flores, on the west side of the Comayagua valley, La Paz has adequate soil moisture and access to irrigation which differentiate farmers in this zone. Depending on the season, the towns of Cane and Lejamani were also included in this zone.

El Rosario

This zone, between 20 and 26 km northwest of Comayagua, was a mountainous area with fairly low soil fertility and a potential erosion problem. Having the lowest agricultural potential and the least flexibility with regard to alternative cropping systems, this zone was selected as representing typical Honduran hillside agriculture. Since corn and beans were the predominant crops, it also fit in with PNIA's basic grains emphasis and Honduran government priorities.

San Jeronimo

Located some 35 km north-northeast of Comayagua, this zone is a small valley at the base of the mountains on the road to La Libertad. The latter is a coffee zone, and most of the San Jeronimo farmers either have some coffee in the hills, or work in the coffee harvest.[1] This zone is intermediate in agricultural potential and cropping systems complexity (Table 2). With the exception of Flores, San Jeronimo was the most homogeneous agro-climatic zone of the four. Even so, there were two different main soil types present which largely explain the location of the rice and corn cropping systems in the area.

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[1]One early hypothesis was that basic grains management in the zone might be fairly slack during the coffee harvest but this hypothesis could not be confirmed.

Table 3. Characterization of FSR Zones, Comayagua Region of Honduras, 1978

Zone	Is Irrigation a Possibility?	Percent Average Slope	Average Farm Size, Ha.	No. of Existing[a] Cropping Systems	In Order of Importance, the 3 Predominant Cropping Systems Identified Were:	In Order of Importance, the 3 Most Important Problems Listed by the Farmers Were:
Flores	Year-round	0-2	5.0	25	1) Corn in spring followed by corn intercropped with beans in fall 2) Tomatoes in spring 3) Three tied for 3rd: a) Corn monoculture b) Rice monoculture c) Corn in spring followed by tomatoes in fall	1) Fall armyworm in corn 2) Bird damage in corn 3) Slugs (Babosa) in beans
La Paz	Supplemental	0-2	10.6	19	1) Corn intercropped with sorghum in the spring 2) Corn monoculture 3) Cassava monoculture	1) Fall armyworm in corn 2) Bird damage in sorghum 3) Bird damage in corn
El Rosario	No	25-30	3.6	3	1) Corn in spring followed by beans in fall 2) Corn and sorghum intercropped in spring 3) Corn monoculture	1) Slugs (Babosa) in beans 2) Two tied: a) Fall armyworm in corn b) Bird damage in sorghum
San Jeronimo	Yes, but currently there is almost none	0-2	4.5	10	1) Rice monoculture 2) Corn monoculture 3) Corn intercropped with beans	1) Fall armyworm in corn 2) Two tied: a) Bird damage in corn b) Carapacho in rice

[a]As identified from 28, 28, 28, and 27 questionnaires for Flores, La Paz, El Rosario, and San Jeronimo, respectively.

Formal Questionnaire (Encuesta)

With assistance from the rest of the CU, the FS economist and the first CATIE outreach agronomist prepared the initial formal questionnaire (Table 2) to elicit more specific information about the predominant cropping systems.

The initial questionnaire was pre-tested in one day using a sample of 20 farmers in the highlands surrounding La Esperanza (Comayagua Department), as interest in FSR had already been expressed by researchers there. The enumerating teams, composed of one researcher and one extension agent, discussed the results on the second day, and several questions were modified or eliminated.

The questionnaire was then modified. Several regions contributed the necessary manpower and vehicles to facilitate in administering the modified questionnaire to the four previously identified zones in the Comayagua Region. During four days of farmer interviews, 111 questionnaires were completed and later summarized to aid in the design of the farm trials during the first cropping season. Some of the disadvantages encountered in administering the first questionnaire were:

(1) It was done by novice interviewers;

(2) The CU had not reached internal agreement about which types of information should be gathered;

(3) Some traditional PNIA researchers resented the questionnaire process, as they thought it was a step backward in agricultural research in Honduras;

(4) Although invited to participate, extension workers could not participate because of scheduling conflicts;

(5) The lists of farmers in three of the zones--drawn by random sample from 1974 property owner's lists--were more trouble than they were worth because many on the list were owners of convenience or because the parcels had changed hands. However, interviews based on random personal contacts (in El Rosario) may have provided a sample biased toward the "better" farmers, as some respondents would point the interview group toward Don Juan, because "he's a good farmer"; and

(6) Tabulation of much of the questionnaire was done one weekend by two researchers and not simultaneously in the evenings by the enumerating teams. Thus, there was no indication that certain questions were systematically being slighted until it was too late to remedy the situation.

Design of Farm Trials (Ensayos de Finca)

The CU then discussed which zones to work in and what types of trials should be conducted in each zone (Table 3). The preliminary results of the questionnaire were discussed for the first time. During this discussion, some researchers maintained that farm variability, being greater than experiment station variability, required a greater number of trials for statistical representability, while others contended that the research

group was too small to be able to manage such a large number of trials. A compromise was reached between these two points of view and zonal farm trials were designed.

Meanwhile, zonal selection was based less on agronomic, economic or social importance, and more on geographic diversity and contrasts which would help the researchers refine the FSR methodology and provide a variety of work experiences for in-service trainees. A major problem encountered during this phase was that the questionnaire summary did not adequately characterize each zone. For example, in La Paz, three distinct spatial arrangements of corn and sorghum were recorded. Trials were designed around these three and a fourth spatial arrangement from Nicaragua. However, it was later discovered that time of planting was more critical than spatial arrangements. Planting time was initially overlooked because cattle production was not given adequate priority in the cropping system. However, time of planting was determined by the farmer's favoring either forage or grain production.

The CU concluded that the formal questionnaire phase was too general and too inflexible to refine the impressions of the reconnaissance survey meaningfully.

Selecting Experimental Sites for Farm Trials

While designing farm trials, any FSR team should consider how they will resolve the following issues to make best use of their given manpower and mobility constraints:

(1) How many zones can the team cover adequately per region?

(2) Within each homogeneous zone, how many farms (sites) are required to represent the underlying zonal variability?

(3) Once the number of farms/zone has been determined, how many trials would the FSR team recommend per site?

(4) Given the distance between FSR headquarters and the zones, and the geographical distribution of farms within the zones, how many trials/farm can the FSR team manage comfortably?

(5) If the number of trials determined by (3) above is greater than that from (4) above, the team should defer the extra trials until a later season or until more manpower is available.

(6) The FSR team must verify that the number of replicates/trial, and the number of treatments (plots)/replicate does not exceed the size of the smallest area borrowed from a collaborating farmer in the zone.

(7) The maximum amount of area a team should borrow from a given farmer, particularly when FSR has no history in the region, is 10 percent of his holdings.

We established at least five experimental sites (farms) in each zone. Each site contained two to four different on-farm experiments or trials. The zones were reasonably well defined and small enough so that five sites were judged adequate to insure coverage of the within-zone variability. Between 10 and 20 individual trials on five or more farms

was about the maximum load that a conscientious FSR team of two to three researchers could manage with one vehicle. Of utmost importance in site location is site description. Thus, five farms within a zone are adequate only if the farms are consciously selected to represent the variation in topography, soil type and farm management prevalent in the area.

We borrowed 1,000-2,000 m^2 of land from each cooperating farmer. This area permitted us to plant two to four trials of three to six treatments (plots) each. An individual trial averaged 500-600 m^2 in area. Plot size varied but for corn and sorghum we used approximately 25 m^2, and rice and beans, 15 m^2. Most experiments had three to four repetitions, as well as border plots and alleyways to facilitate entry and good note taking, but some had as few as two repetitions. In areas with both Spring and Fall plantings, the latter had fewer experiments so that the team was not overwhelmed when Spring harvest overlapped Fall planting in November or December.

The philosophy of the CU was to plant at least one variety trial each season, enabling farmers and researchers to see a wide range of newly-released materials. These trials also allowed the farmers to begin thinking about new cropping calendars: calendars based on disease resistant variaties or new shorter cycle varieties. The remaining two or three experiments were usually based on questionnaire data analysis and focused on plant protection (weed control, insect control) or agronomy (plant spacing, date of planting, land preparation).

Selection of Collaborating Farmers

Potential collaborators were contacted with the help of extension in the zones of La Paz and San Jeronimo, and by the researchers themselves in El Rosario, a zone with no extension service representation. In the three zones it was not too difficult to identify the major within-zone variation and select cooperators whose farms covered this variation.

Criteria used for selecting collaborating farmers were: (1) The farmer operated a small-to-medium sized farm; (2) he was planning to plant most of his land to the predominant farming system in the zone; and (3) he had at least enough land so that a total loss of the trials would not cause him great economic hardship.

Assigning FSR Teams to Homogeneous Zones

Three teams of two researchers each were formed to conduct the farm trials in the three zones. By the summer of 1978, each zone had at least two researchers sharing responsibility for the farm trials. A work vehicle was assigned to each of the three teams.

As agronomy students in their final year of study at CURLA (University Center of the Litoral Atlantic Region) became available, they were recruited into the CU by the Honduran FSR leadership. These students generally spent 10 months as in-service trainees, and each was assigned to work in one of the three zones. From the beginning, the trainees were considered co-workers on the FSR teams. Each was expected to devote 60-75 percent of his time to field work and FSR application, and to develop a meaningful, FSR-related, senior thesis topic.

Field Supplies and Seeds for Farm Trials

The next step was to assemble experimental inputs (seeds, fertilizer, insecticides, herbicides) and support supplies (vehicle, tape, shovels, machetes, sprayers, tags, etc.) so that trial planting was rapid and professional (Table 3). In accumulating supplies and materials, funding from IDRC (International Development Research Council of Canada) and CATIE (Agricultural Center of Technology and Education) was crucial to initial FSR research.[1] A small fund was made available to the CU so that input purchases could be made quickly from local stores. Grant or loan availability at the local level is often a truer measure of effectiveness than its amount.

Farm Trials and Farm Record Keeping

Methodology of Implementing Farm Trials

Planting

Planting the first crops in the FSR associations began in El Rosario on the 2nd of May, 1978, and ended more than a month later, on the 27th of June, 1978, in a farmer's field in the zone of San Jeronimo. Altogether, 67 trials were planted on 23 farm sites in the three zones. The total number of parcels observed during 1978 was 660.

Whenever possible, the FSR team would lay out the trial and then monitor the farmer and his helpers to make sure they planted the trial correctly. Some trials had to be planted directly by the FSR team, because: (1) two collaborating farmers were planting the same day; and/or (2) the farmer did not wait for the arrival of the FSR team before planting his own portion of his field. Participation of farmers in planting ranged from none to significant.

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[1]The first CATIE outreach agronomist set up a petty cash fund for small item purchases and work vehicle maintenance. He also made his own vehicle available for work (as did the FSR training specialist).

Monitoring and Observing Trials

Many crops emerged in early trials before other trials were even planted. Thus, the FSR teams made independent emergence observations before the CU met to standardize measurement and monitoring procedures. In addition to observations taken on the crops during the season (plant counts for density; disease evaluation; etc.) several farmers in each zone were provided with rain guages. They recorded daily rainfall data which were collected about once a month by a team member on a standardized form.

Harvest

The harvest should be carried out with the farmer's assistance. Coordinating a harvest with the farmer is perhaps even more difficult than coordinating planting. Where two or more crops are grown in association, they are seldom harvested at the same time. This means scheduling at least two harvest dates per trial site. In addition, proper harvest timing, equipment and measurements (both before and after harvest), are critical in assuring continuity of worthwhile data.

Planning Field Trials, Second Half of Season **(Postrera)**, 1978

All farm trials in the fall of 1978 contained legumes (common beans, cowpea and mung bean). Cultivars were selected based on continuous personal contact with the bean project. These fall trials were planned during a CU meeting the last week of August. At the same time, station trials were proposed on the control of nutsedge, minimum tillage, and control of Apion (Apion godmani Wagn.) and Empoasca (Empoasca kraemeri).

While there was some informal discussion on how to integrate FSR and station trials, the CU never determined how best to utilize an experiment station to complement farm trials. One objective of the station trials was to provide in-service trainees greater exposure to different types of research trials. However, these trials, especially during the 1979 season, diluted the manpower of the FSR teams. Some CU members felt that more of the station effort should have been dedicated to a better understanding of the local farming systems. It was also easier and less of a risk for the trainees to dedicate more time to thesis topics on-station than on-farm. However, one of the unique advantages of FSR over traditional research is that it can provide guidance to students for thesis topics which are relevant to the predominant crop systems of a homogeneous zone.

Another issue concerning FSR and station trials was the irrelevance of some of the farm trials to researchers working in the Comayagua experiment station. Replicates of all trials in El Rosario, San Jeronimo and La Paz were placed on-station. However, climatic, topographic and agronomic conditions differed between the former two zones and the station to such an extent that their trials were not really replicates of the farm trials. In addition, yields in the trials replicating La Paz research were double those of

the average of the farm trials in that zone, severely undermining the contention that these trials were simply replicates of the La Paz trials.

Analysis of Field Trial Results

During each cropping season, teams kept field notes and a master notebook that remained in the training center. These sources of information proved very useful when the experiments were analyzed (Table 3). The analysis began with a simple analysis of variance, and then, ad hoc across-location comparisons were made to determine which treatment(s) consistently out-performed the check throughout the zone.

Unfortunately, not enough time was allowed for this phase of FSR. This phase also proved to be the most difficult stage for the in-service trainees. They encountered difficulty both in the mechanics and the interpretation of the analyses.

No formal across-site analysis was done, due partly to the time constraint and partly to high site and zone heterogeneity. Different parcel sizes were harvestd on different farms, which caused some replicates and/or treatments to be eliminated at some sites. These field-level modifications were often necessary because the proposed trials were either too ambitious in scope or too large for certain farms. Finally, no economic analyses were performed on any 1978 data.

Redefinition of Farm Trials

During the Spring, 1979 Farm Trial Workshop for the second group of trainees, the major results of the 1978 trials were presented for La Paz, El Rosario, and San Jeronimo. One of the main conclusions from the 1978 season was that there were too few CU researchers to supervise the farm trials and strengthen ties to researchers in other regions. Thus, it was decided that 1979 farm trials would be managed by in-service trainees. Trials were developed for each zone, and groups of trainees assigned to each zone. A similar process was used in proceding from the 1979 to 1980 trials. Table 4 provides a summary of the Comayagua Region FSR trials by year and type.

Implementing A Farm Record Keeping System

Questionnaires, regardless of how well-designed, often fail to elicit the responses or provide the details desired by researchers. This is especially true for certain socioeconomic questions because:

(1) people frequently conceal their economic situation;
(2) a lack of a record-keeping system leads to guesses which cannot be confirmed;
(3) farmers associate questions about economic matters with attempts to increase taxes, or with the Agrarian Reform program; and

Table 4. Types of FSR Trials Conducted in the Comayagua Region, By Zone, 1978-80

Zones: La Paz	El Rosario	San Jeronimo
Year: 1978		
Corn varieties ((Corn + sorghum) + soil insecticide) (Corn + fertilizer) Legume varieties	Corn varieties Sorghum varieties (Corn + soil insecticide) Legume varieties	Rice varieties Rice demonstration lots (Rice + weed control) (Rice + fertilizer) Soil insect control
Year: 1979		
Corn varieties (3 corn varieties + 2 bean varieties) (Local corn+local sorghum) versus (Local corn + improved sorghum) ((Corn+sorghum) + fertilizer) (Corn varieties + fertilizr) (Sorthum + spacing + fertilizer + management) Bean varieties	(Corn + fetilizer) Corn varieties: 3 maturities Bean varieties Soil conservation	(Herbicides + dosage + timing) (Fertilizer + dosage + timing) Rice variety trials
Year: 1980		
Livestock trials, including: -fodder from sugar cane -livestock survey -mixed farming systems Corn varieties Maturity: corn versus bean Fertility	Corn varieties Fertility (Density + variety + fertilizer) (Corn + sorghum)	Corn varieties Rice varieties Weed control Date of planting

(4) recollections of weekly labor use are too often inaccurate for use in recommending intensive technological changes, especially if such changes require more labor than is likely to be available in the zone during this time period.

Farm records were introduced to obtain more detailed information than could be collected through a formal questionnaire. The farm records were designed to generate such information as daily labor inputs by field, cost of purchased inputs, etc. During 1978, a farm record form was prepared by modifying those used at ICTA (Institute of Science and Technology of Agriculture) in Guatemala to include units of measurement unique to Honduras. Nine collaborators (four from La Paz, three from El Rosario, and two from San Jeronimo) were selected to handle farm records. All farmers had CU farm trials, and six kept rainfall records.

The FS economist was aided in installing records by the training specialist and the extension agent in La Paz, the extension agent in San Jeronimo and a member of the first group of trainees in El Rosario. Visits to collaborators were made at intervals of approximately two weeks to confirm data collection compatibility.

Several major problems were encountered in managing these farmer-maintained records. These included the following:

(1) The farm record phase received low priority from the CU staff;
(2) CU researchers were spread too thin in managing farm trials to adequately supervise farm records;
(3) the amount of time necessary to install and monitor a group of farm records was continuously underestimated;
(4) the lag time between the explanation of how to complete the entries in the record books and the time when a farmer could actually perform this exercise reasonably well was longer than anticipated; and
(5) the necessity for farm records was never adequately explained to the FS research team.

The final point was crucial, as goals and objectives of record keeping need to be specified far in advance of the installation step. An untimely illness in the CU led to the early demise of the initial record books.

In 1979, the CU used record forms developed for the National Development Bank (BNF) by an Oklahoma State University/Colorado State University team of agricultural economists. Only those sections of interest to the research objectives of the CU were completed. Use of these forms initiated a tentative link between PNIA and BNF, and lessened duplication of effort.

Assistants were hired to help with record keeping in 1979. Criteria for selection included literacy, living in the community, sufficient spare time, and an interest in completing the data collection. One assistant was hired for each zone. Using a mixture of selection procedures, each collaborator was interviewed once a week by the regional

assistant. Entries maintained included farm labor, input purchases, and grain sales. At the suggestion of the BNF group, the visits were usually made on either Saturday or Sunday, when the farmers were most likely to be home. This interview schedule proved to be quite satisfactory.

Some of the problems encountered in farm record keeping during 1979 were:

(1) delay in contract approval and pay disbursement from PNIA was so long that one assistant left the project early (after a work stoppage and a subsequent work slowdown), eliminating the chance to obtain any useful information from his zone;
(2) the BNF forms proved to be too complicated, and outlines of simpler forms were developed in late November, 1979, for use in 1980; and
(3) summaries of costs of farming operations and grain sales were not completed in time to assist CU research staff design trials.

As a result, the times of peak labor demand were not extracted from the records for use in modifying trial design for the following season.[1]

Other Questionnaires

In 1978, the CU researchers designed five questionnaires to focus on specific problems in cropping systems, to give the new trainees some experience in survey techniques and to design more relevant experiments for the FSR program. They dealt with the farming systems and sesame cropping systems of Choluteca, land preparation techniques in semi-arid La Paz, soil erosion problems in steeply sloping El Rosario and common bean systems and problems in the regions of Danli and Olancho.

Farming Systems in Choluteca

Forty-five farmers were interviewed in five zones by representatives of research, extension and human resources. The five zones contained between one and five sub-zones. Between 7 and 11 questionnaires were completed per sub-zone. While the results were partially analyzed by CU researchers, regional researchers never completed the analysis. The methodology used in selecting farmers for interviews also detracted from the validity of the data-gathering process. While farmer interviews in some sub-zones were conducted at random, other sub-zones interviewed only farmers from the contact lists of the extension service personnel. Thus, results between sub-zones were not strictly comparable.

Sesame Cropping Systems of Choluteca

The bean questionnaire (see Bean Systems and Problems in Danli and Olancho, which follows) was used to design a questionnaire for studying sesame cropping systems.

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[1]While farm records were also kept during 1980, the record book assistants had not been paid from December, 1980 until the preparation of this paper in mid-1981. Suspicious that they may never receive their back pay, they are holding their record books for ransom.

Twelve farmers were interviewed. Seven of the 12 growers planted sesame in association with either corn or sorghum, while the sesame project had never conducted a trial in association with any other crop. These results led to a revision of the objectives of the sesame project research.

Land Preparation in La Paz

In La Paz, the land preparation questionaire, developed and applied by the FSR agronomist, revealed that farms with less access to irrigation water placed greater dependence on livestock. This affected the crop residue handling, accessibility of animal traction, and the type of crops grown. As a result of this survey, the CU focused on timing of land preparation as a solution to the cultivation bottleneck which normally occurred with the first May rains, investigating land preparation from March through June, with oxen and tractors, and with and without herbicides. Plowing the dry soil, waiting until the rains began and then planting corn with herbicides was an option which permitted earlier planting, left more time for the Fall relay crop of beans, and was not prohibitively expensive.

Soil Conservation in El Rosario

The purpose of the soil conservation survey in El Rosario was to gain a better understanding of how farmers perceived their soils, yields, and soil fertility. Also examined was the time farmers spent in land preparation activities. The results of this survey indicated that a minimum tillage strategy had little relevance since most of the stover and forage was either eaten by livestock or burned. Also, the use of living hedgerows (pineapple, sorghum, lemon grass) on contours made little sense to farmers renting fields because these fields were heavily grazed by the landowner's herds during the dry season. As a result, the CU decided to work only with farmers who owned their land and had it fenced. Fencing allowed farmers to plant fruit trees and sisal on the portions of their holdings that could be taken out of annual cropping, and construction of contour walls or live hedges (from locally available materials or plants) on the land remaining in crops.

Bean Systems and Problems in Danli and Olancho

Questions of bean culture practices led to the development of the bean questionnaire for Danli and Olancho. It was also designed to interest bean researchers in discovering on-farm problems of bean production. The highlights of the Olancho results were:

(1) row-to-row and plant-to-plant spacing were quite variable;
(2) earliness and drought tolerance were important plant characteristics;
(3) lodging was recognized but not considered a problem in farmers' varieties;
(4) seed size was found to be more important than color;
(5) the variety planted was either cuarenteno or cincuenteno;

(6) all plantings were by oxen and in monoculture;
(7) the use of insecticide was low; and
(8) storage methods were variable but seemed to include insect control measures.

Being less reliable, the Danli results are not presented. However, the questionnaire served to show the bean research staff a bean region more important than Danli with distinct cultural practices and varietal traits. Before the questionnaire was administered, the Olancho region was not served by the bean program.

Training Honduran FSR Teams

Background

Since a large proportion of agricultural college graduates in Honduras came from an urban and university background which left them ill-equipped to communicate with farmers and perform on-farm research, there was need to develop a practical training program for young researchers in PNIA. The training phase of FSR began informally in 1978 when the first group of three trainees joined the three regional FSR teams.

Formal training began in early 1979, and combined theoretical aspects, specific themes, seminars and workshops, with the practical training experiences of characterizing zones and assisting in the design, implementation, management, harvest and analysis of the farm and station trials. Training lasted 10 months, with 75% of the trainee's time dedicated to practical field experiences. The training stressed areas which were weakest in the trainee's previous education: statistical analysis with major emphasis on interpretation of results and drawing conclusions, experimental design, pest control and management, economic analysis and technical communication.

The driving philosophy behind training was to encourage young agronomists to study cropping systems from the farmer's point of view, including control of insects, diseases and weeds and the relationship between the soil, water and plants. The training program required each trainee to come in close contact with the problems actually experienced by Honduran farmers through the study of integrated crop systems, thus giving trainees the capacity to identify farmer's predominant problems, analyze the existing situation and suggest possible methods for improving it. Training was considered an essential step in producing technicians who could understand and carry out FSR in all regions of Honduras. The detailed objectives of training were to:

(1) Integrate theoretical and practical issues;
(2) Stress the development of independent thought over memorization;
(3) Stimulate imagination and creativity;
(4) Stimulate deeper understanding of how regional and national problems affect farmers;
(5) Develop an appreciation of multidisciplinary research and promote the ability to understand systems of production encompassing biological, agronomic, cultural, and socioeconomic aspects;

(6) Develop an attitude conducive to team rather than individual research; and
(7) Promote the understanding that PNIA should work with other institutions involved in regional and national development.

A list of the formal short courses and seminars given to the trainees is provided in Table 5. Topics ranged from very specific ("environmental effects and stalk rot in corn") to very general ("regional development"), from one-hour seminars to week-long courses (short course on Integrated Pest Management); and from office-oriented (short course on statistical analysis) to field-oriented (short course on weed control).

Results of In-Service Training, 1978-80

During 1978, the ratio of CU FSR professionals to in-service trainees was 2:1, and there was daily contact leading to assimilation of FSR philosophy and methods. In 1979, nine trainees completed the program. There was less trainee/researcher contact during this training season. Problems which arose in 1979 included poorer farm trial management and inadequate attention to field books. During 1980, eight of nine trainees completed the program. The ratio of field work to theory during 1980 was about 60:40. Although this balance was less than ideal, the trainees spent a great deal of time in intense field work.

Positive Aspects of FSR In-Service Training

Experience Working with Farmers

Farm level training offered the trainees an opportunity to deal directly with farmers and to work under farmers' conditions. This experience served to demonstrate the ability of the farmer to handle advanced technology. The concepts of risk and environmental variability were grasped very quickly by the trainees, and the farmer's decision-making rationale was appreciated. Also, the ability of each farmer to integrate different agronomic, biological, cultural and socioeconomic factors to make his particular production and marketing system viable was often appreciated fully for the first time.

Practical Experience

An important benefit of FSR training revolves around researchers' attitudes toward farming, farmers, and the role of agriculture in national development. At least one-half of the trainees were deeply affected by the experience, leading them to reconsider both their profession and the role of research. This positive change of attitude toward the agricultural sector of Honduras was a very important by-product of the training program. In Summary, FSR training effectively allows professional agronomists to recognize farmer needs and to acquire the ability to improve technology to fit traditional farming systems' constraints.

Table 5. Short Courses and Seminars Presented to FSR Trainees, 1978-80

Seminars	Short Courses
	1978
Environmental effects and stalk rot in corn Insect control in crop systems Technical tour of ICTA program (Guatemala trip) A concrete experience of regional planning Regional development A survey of reformed groups: some selected results	None given
	1979
General aspects of Sorghum Downy Mildrew (SDM) Minimum tillage Elements of a regional diagnostic survey Agricultural extension Linkages of agrarian politics Improved pastures in Honduras Research in soybeans	Statistical analysis Selecting clean seed in common beans Applied statistics (workshop) Research in agricultural systems of production Weed control IPM (Integrated Pest Management) Farm management Economic analysis of farm trials
	1980
Insecticides Managing technical information Regional diagnostic surveys Pastures and forage crops Sorghum Downy Mildrew (SDM) International programs Goats Rural technology Farm record keeping Minimum tillage	Introduction to in-service training Statistical analysis Soil conservation Farming systems Dairy cattle Communicating technical information Definition of homogeneous zones (workshop) Managing data collection in homogeneous zones Developing questionnaires (workshop) Administration of, and results tabulated from, questionnaires (workshop) Farming systems in La Esperanza (workshop) Discussions of farm trials in FSR (workshop) Scientific photography (workshop) Planning fall farm trials (workshop)

Extending FSR to Other Regions

Since 1976, the proportion of total experiments conducted by PNIA researchers on farms has jumped from approximately 12 percent to over 52 percent (USAID, 1981). The Olancho Region has gone from virtually no agricultural research in 1977 to 161 trials in 1980, of which 61.5 percent were conducted in farmer's fields. Plans for 1981 are for an even greater on-farm effort. The region, which contains the Guayape Valley Project (roughly a $9.5 million World Bank loan with about $4 million in Honduran government counterpart funds), plans to hire two more researchers for the existing zones of Catacamas and Juiticalpa, and one each for the new zones of San Francisco de Becerra and San Francisco de La Paz. The regional PNIA research coordinator, a former CU trainee, and the Director of the Guayape Valley Project have been able to integrate regional research and extension, including the sharing of planning, vehicles, and field work activities. While this regional effort is a special case, it points out the advantages of coordinated FSR efforts.

IV. KEY PROBLEMS IN ORGANIZING AND INTRODUCING FSR

The purpose of this chapter is to highlight key problems encountered in introducing FSR.

Problems of Introducing FSR to Personnel of PNIA and Other Institutions

Philosophical Difficulties

PNIA program headquarters and the CU had two major tasks for implementing FSR: (1) promotion of the idea within PNIA and (2) securing internal political and budgetary support. The accepted role of program headquarters was one of orientation, coordination, resource procurement and distribution. Regional operations were controlled by regional directors. After expressing initial reservations, many regional directors tentatively accepted the philosophy of FSR.

The visits of the CU FSR researchers were received with complete acceptance in La Esperanza but were opposed in San Pedro Sula. More indifference to on-farm research was encountered from the more traditional crop specialists, who favored the traditional, technology package (tech pack) approach. This approach is of limited use for long-term rural development in Honduras. CU researchers spent considerable time explaining that the gradual approach of on-farm research was not incompatible with high technology, high production research methods, but was complementary to it, as FSR addresses the problems of those farmers who cannot afford traditional tech packs.

A sub-group of SRN researchers opposed FSR from the beginning. Members of this sub-group attacked the importance of farm research while defending the traditional emphasis of commodity projects. These researchers also objected to the FSR emphasis on research conducted under the predominant conditions of the farmers and their corresponding crop systems, and the system of in-service training. They thought the status of the researcher within the SRN was in jeopardy. A lack of social sensitivity and excessive disciplinary zeal rounded out the attitudes of those opposed to FSR. Finally, this group expressed legitimate concern about the extra time required to implement FSR.

The management system of the SRN did not permit the head of PNIA to reward researchers of merit, or to replace or transfer those who were uncooperative. At times, some of the better researchers in PNIA were hampered by regionally-imposed administrative and logistic constraints, and PNIA leadership was powerless to counteract this. However, some research personnel soon adopted the FSR guidelines and suggestions provided by the CU, and the La Esperanza research group employed innovative FSR from the beginning.

Another source of internal friction was the emphasis on on-farm research. FS research was viewed as being directly opposed to improving the physical infrastructure of existing experiment stations. The CU could have emphasized more that strong commodity projects are necessary for FSR support, and that FSR was complementary to, not a competitor of, such projects.

The PROMYF project, funded for three years (1976-78) by the Interamerican Development Bank (BID) and based in Danli, was a joint research effort backed by CIMMYT and CIAT to increase production of corn and beans. This project was based on tech packs using free credit from BID. PROMYF trials were production/demonstration oriented, with research being limited to the verification of imported technology. Collaborators were selected on the basis of production potential, not need. Methodology and problems of execution limited the value of the results of these trials. Very little cooperation existed between PROMYF and other interested Honduran institutes, including PNIA.

In 1979, when external funding for the project ended, PROMYF was incorporated into the DGOA of the SRN and renamed PROMYFSA. PNIA and the CU became involved in planning experiments carried out by PROMYFSA. Finally, PROMYFSA became the Basic Grains Project and included rice and sorghum.

Methodologically, the problem of PROMYF is that technology packages are only useful to a small percentage of Honduran farmers, leaving the majority unaided. PROMYF would tell these farmers to eliminate various inputs from the tech pack based on their (tech pack-1) experiments. But, since most small farmers cannot afford to change more than one or two small practices during a given cropping season, these growers need the opposite information: what tech pack component, then added to his existing system, yields the highest marginal return? The (tech pack-1) experiments do not permit calculating such returns.

FSR, as instituted by PNIA, was obstructed as often as assisted by some international institutes. Many external problems stemmed from the bureaucratic tendency of these institutes to defend their privileges and terms of reference so as to remain in favor with their donors. In the late 1970's, these institutes were more interested in using national programs as replicates for progeny testing trials than they were in assisting them in their agricultural development.

The Honduran commodity programs generally have too little manpower to handle all of the requests from the International Agricultural Research Centers. For example, CIMMYT requested Honduran corn researchers to carry out International Progency Testing Trials (IPTT) and Experimental Variety Trials (EVT). In 1977, 9 IPTT's, each with

512 observation plots, were planted in the Guaymas station in Region 3. Such trials compete with the primary task of the few trained breeders to adapt improved varieties and technologies to Honduran farming conditions. IPTT's are far too complex for Honduras to handle. International centers should assess the capabilities of a given national program or project and not encourage or permit such overloads on trained manpower.

During 1977 and 1978, some international center's outreach teams bypassed the head of PINA to work directly with commodity project heads. Fortunately, this situation was resolved by 1981. The economics unit of CIMMYT and the new CIMMYT outreach team support both the FSR philosophy and the training effort. CATIE encouraged FSR and shared its experiences with the CU. As a regional center, in contrast to an international one, CATIE attempted to assist PNIA researchers adapt FSR to the physical, biological, economic and political realities of Honduras. While CATIE does have its own farming systems methodology, an effort was always made to consider Honduran priorities first. Other outreach programs have much to learn from this outreach philosophy. While some of the positive interaction between PNIA and CATIE was based on personalities, the absence of a patronizing attitude was highly valued and contributed toward getting on with FSR.

ICTA was perhaps the most relevant source of FSR information for PNIA, and frequent trips were made to Guatemala. In some cases, ICTA personnel came to Honduras to participate in CU training activities.

Problems of Linking-Up with Other Units of the Ministry and Outside Institutions

Extension and Research Linkages

A gap exists between the Honduran extension service and experiment station research. Honduran extension agents have less formal training, more institutional mobility, and face the requests and recriminations of farmers more directly, than researchers do. Rarely does research develop technology directly useful to extension and farmers. Extension has not participated in research planning, so extension agents have, in general, ignored past research activities.

Since extension methodology was also in transition during 1978 and 1979, this provided an opportunity to develop extension and on-farm research linkages. Extension began by characterizing their zones to permit the agents to become better acquainted with farmers and their problems. Using this information, each agent submitted a work plan to address the pressing problems of his zone. This information also provided a quantitative base for forming research priorities. In 1979, zonal characterizations were made collectively by regional personnel from both extension and research. One regional

director participated personally to show his support for the approach. By 1979, some good informal working relationships had developed between on-farm research teams and extension agents. Implementation and acceptance of FSR was invariably faster when extension was involved from the beginning.[1]

The CU and PNIA Headquarters

In time, communication between the CU and PNIA headquarters became more sporadic, often the result of emergencies. Added activities at both levels prevented closer communication.

PNIA and Sector Planning

Sector planning of SRN is responsible for reconciling the Annual Work Plan with the SRN program budget (for presentation to the Ministry of Finance), and for evaluating regional performances. However, Sector Planning has often proposed crop production and diversification projects in the past with little or no attention to technological feasibility.[2]

Recently, working relations between PNIA and Sector Planning have improved, culminating with the joint preparation of the Annual Work Plan and Budget of 1980. The work plan was developed upward from the local extension offices through the central headquarters of all programs. This process was so effective that budgetary discussions among Sector Planning, the DGOA and the Ministry of Finance, normally lasting three days, required only a morning meeting.

PNIA and USAID

Project funds from USAID were to have been disbursed directly from PNIA, but the Honduran Government required such disbursement via the Ministry of Finance. Funds were disbursed when PNIA submitted vouchers against a revolving fund in the Ministry of Finance. Initial disbursement was slow, and PNIA was held responsible for any irregularities. Purchases of equipment had to satisfy both Honduran and USAID procurement regulations.

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[1]For example, the working relationship between the FSR team and the extension agent in San Jeronimo was excellent. There was no extension agent in the El Rosario zone, and those in extension in La Paz showed little interest in FSR. In Olancho, excellent working relationships have developed between research and extension, largely due to the efforts of the research coordinator and the regional director.

[2]For example, the castor bean project was introduced with a large publicity campaign, but without basic agronomic information and no improved seed. Initial plantings of imported seed were eliminated by a disease which was normally of little importance on the scattered castor plants indigenous to Honduras. This project had to be cancelled after two years because planning was not based on feasibility studies.

An AID project manager with sufficient agricultural experience to reconcile field operations with administrative issues would be of great assistance to FSR implementation. Strict adherance to the 3-bid procedure for local procurement, for example, is absurd during certain FSR field operations.

PNIA and Other External Institutions

Viable working relationships between PNIA and other institutions (e.g., CATIE, IDRC, IICA, CIMMYT, CIAT, CIP, and the Peace Corps) were achieved with varying degrees of difficulty, or not at all. In cases where initial reluctance was encountered, such an attitude was stemmed from a lack of respect for Honduras' past research effort. Such skepticism was not without some merit. It was particularly difficult to establish better links with CIMMYT, CIAT, and IICA, because of their traditional interactions with PNIA. Once the goals and objectives of FSR were better defined by PNIA researchers, collaboration generally improved. One exception was the working relationship between PNIA and IICA. As PNIA matures and internal regional priorities become more clearly defined, external agencies will have to tailor their support more toward nationally-defined needs and goals.

PNIA and Regional Directors

The PNIA/Regional Director relationships depended on the personal attitude of the regional director towards the new research focus. FSR received regional approval in Regions 4, 5 and 6, was ignored in Region 2, and continually faced serious problems in Regions 1 and 3.

The relations of the DGOA, and PNIA in particular, with the seven regional directors have improved greatly since 1977. Initially, relations were strained as the normative role of DGOA/PNIA and the operative roles of the regional directors were not well defined in 1977.[1] By 1978 and 1979, the role of National Programs were better defined, resulting in improved relationships between PNIA and the regional directors. A major step in improving this relationship was completion of joint work plans in 1979 and 1980 by PNIA and regional PNIA staff. While redistribution of earmarked research funds and unapproved personnel changes still occur regionally, integration of work plans and budgets has reduced these problems.

Problems of Acquiring Sufficient Resources to Implement FSR

Budgetary Restrictions

While high-level administrators in the SRN approved of FSR, the task of implementing it and selling the philosophy to the rest of the researchers was left to PNIA and the

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[1] Regionalization was not begun seriously until 1975 in Honduras.

CU. However, research was not a line item in the annual budget, so PNIA Headquarters had to locate funds on its own to initiate FSR. The only viable sources of FSR funding were external from 1977 to 1980.

Disbursement of funds from AID began in mid-1979, eighteen months after FSR began in Comayagua. Disbursement of AID funds was slow because of administrative procedures, but this funding became a stable and vigorous source of support to FSR. A good working relationship was established between PNIA and the local AID mission. Several CU members were paid with AID funds, and work vehicles and other equipment were purchased. Sporadic financial support was also obtained from other institutions (CIAT, FAO, CIMMYT, Peace Corps, and IICA).

The Honduran Government contribution to PNIA was limited to cost of living increases, with no attempt being made to increase the proportion of budget going toward research (USAID, 1981). Honduran research funds were administered by regional directors who did not always adhere to Program budget allocations. However, in some regions, budgets from other Programs were used to support research activities.

In summary, there was no formal SRN budgetary support for FSR. Funding for FSR came from external agencies and from whatever sources PNIA Headquarters could convince to contribute toward FSR.

Logistical Difficulties

Communication

Separation of the unit implementing FSR from headquarters resulted in a loss of communication. Even though Comayagua was selected for locating the CU partly because of its proximity to Tegucigalpa, there were still serious lags in communication. The head of research could not monitor the FSR team and implementation problems as closely as he could have if the field unit and headquarters had been located together.

Support Facilities, Supplies and Vehicles

While Comayagua had the physical facilities to accommodate the FSR team, offices were actually in laboratory or storage areas. While the station had electricity, there was no running water and no public facilities. Those working out of Tegucigalpa later in the program had trouble locating either office space or desks.

Little flexibility existed for purchase of inputs and repair parts, with the exception of the IDRC petty cash fund. FSR depends on local farmer surveys to determine research priorities and experimental design, trial numbers and necessary inputs. This sequence of events takes place immediately prior to planting. Because of this timing, inputs cannot be anticipated and accounted for in a previous budget, but must be purchased as their need is determined in the field. Most national programs and external

donors do not allow for the budgetary flexibility necessary to account for this change from traditional research methodology.

Transportation was a major problem. The entire FSR effort began with a worn-out, 4-year-old Toyota Landcruiser. Using only this vehicle in all three work zones, such vital steps as the zonal reconnaissance, farmer questionnaires, farm trial planning, planting and initial farm trial observations were carried out. Work vehicles promised to some of the expatriate CU researchers in January, 1978 were finally in use in the program in July, 1979. FSR depends heavily on adequate field mobility for timely trial operations and observations. Mistimed operations (especially planting) can render trial results worthless. One vehicle per work zone is absolutely essential to FSR.

The gasoline shortage problem of the SRN is legendary. The regions normally spend their annual gasoline budget months before the end of the fiscal year.

Personnel Issues

The size of the PNIA staff increased from 45 in 1977 to 90 in 1981. Movement of personnel was frequent during these years, due to resignations, transfers and leave for advanced study. FSR added a logistic and philosophical burden to a small national staff. The lack of Honduran professionals with FSR training meant that the new approach was implemented largely by expatriate CU personnel. Hondurans returning from foreign study to continue agricultural research generally were unresponsive to the FSR philosophy, going so far as to oppose it at times. In order to increase the short-run research benefits to a particular region, some regional directors would assist returning researchers to obtain assignment to the regional experiment station. Such an assignment would mean that the researcher could ignore FSR and concentrate on experiment station research.

Counterparts were not formally assigned to expatriates because of the general lack of trained Honduran manpower. Counterparts could have reduced some of the excessive visibility of the expatriates at policy-making levels. A lack of counterparts meant that the CU researchers encountered difficulty in leaving primary duties to attend to secondary duties in other regions. Expatriates involved in FSR should have assigned counterparts.

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions from the Honduran FSR Experience

The FSR approach to agricultural research began in Honduras with an official attempt to reorganize agricultural research in PNIA. While all of the goals set out initially were never realized, a good deal was accomplished in modifying research philosophy and methodology.

FSR is currently at a crossroad in Honduras. Hondurans involved in FSR CU training had to reevaluate the relationship between the farm, the farmer and agricultural research. The broader picture acquired by these young agronomists because of their close work with farmers as a part of a multidisciplinary field research team is an experience traditional research cannot hope to duplicate. Researchers trained in FSR are much more sensitive to total farmer constraints.

There is a distinct difference between a nominal and a real FSR multidisciplinary team. The former is composed of technicians of various disciplines with common goals working in a common area. The latter is a cohesive unit whose very strength is derived from an open interchange between, and mutual support of, disciplines. It is an evolving entity which requires time to reach the necessary level of frankness and interpersonal trust for truly multidisciplinary interactions.

At times, research within the CU and PNIA was hampered by many obstacles. This factor, together with a lack of trained Honduran personnel, meant CU researchers consistently had more to do than could be well-managed. Requests for their time were so frequent that national research programs suffered. In addition, research programs have both limited agronomic and administrative capacities. External donors and international institutions have to be careful to avoid overloading the administrative and technical capacities of national programs. For various reasons, several of those trained in FSR may soon leave the program. Moreover, training has been eliminated. On the other hand, if an effort is made now by the SRN and PNIA to reinforce FSR (through contract renewals and reinstatement of training), the philosophy may yet be strengthened and be extended to other regions of the country.

Recommendations for FSR in Other Countries

General Political and Administrative Issues

To integrate FSR into an agricultural research program, FSR leadership must have: (1) an explicit mandate and assistance from policy makers; (2) the power to hire, promote, transfer and fire research personnel; and (3) the ability, time and motivation to manage the research personnel. The integration of FSR into established commodity-oriented

research programs will never be free of friction. It is important to minimize such friction by involving established researchers from the beginning and using their knowledge and expertise to help orient the FSR group to national crop research programs, possibilities, and areas of collaboration. FSR cannot function effectively without strong commodity research teams, so they should be strengthened as well as reoriented.

International centers, working through national research leadership, should assess the willingness and ability of national research systems to carry out meaningful collaborative research. Many Third World countries (e.g., India and Egypt) have more than adequate technical staff to collaborate with international centers, while others (e.g., Central American countries in general) lack sufficient trained manpower. Sensitivity to the absorptive capacity of a national agricultural research program should be accorded high priority by international centers.

Specific FSR Integration Issues

(1) Homogeneous Zone Surveys:

A well-conducted, formally-structured reconnaissance survey can replace both the informal (sondeo) survey and the follow-up formal diagnostic survey (see Table 2). Less manpower, vehicles and per diem will be used to conduct a single formal reconnaissance survey than if an informal reconnaissance and a formal diagnostic survey are employed. A quick group summary of formal field notes should provide enough information to select homogeneous zones and assist in design of the first year's farm trials.

There is some debate on the types of surveys which are needed to select experimental zones for on-farm research. On the basis of our FSR work in Honduras and the experience of ICTA in Guatemala, we recommend the multidisciplinary reconnaissance survey approach.

(2) Formal Farmer Questionnaires:

Unless a FSR team has a large number of researchers and/or extension agents, as well as excellent mobility, plenty of time, and a good mechanism for analysis of questionnaires, this step should be eliminated.

(3) Distribution of FSR Manpower and Responsibilities:

During the first year of FSR implementation, distribute available manpower rationally and as equally as possible among zones. If a zone lacks sufficient manpower or vehicular coverage, it should not be included in the research effort until sufficient resources become available. FSR teams should staunchly resist the tendency to spread themselves too thin to be effective. They should take on additional duties and responsibilities slowly and after careful deliberation.

(4) Farm Trial Design and Installation:

Between the survey of farmers and the final design of farm trials, the FSR team should carry out more dialogue with the farmers. During these visits, systems identified by the survey or questionnaire should be discussed in greater detail. Planting times, methods, spacing of rows and hills, and other details need to be confirmed and/or refined. In addition, the research group should share with the farmers their plans for farm trials, asking for reactions. Perhaps some have already had experience with some of the proposed treatments. Either positive or negative results would be extremely useful to the FSR group at this time to refine farm trials to account for regional realities. These farmer discussions may be group sessions to save time. Follow-up visits should allow design of check plot treatments for the proposed trials, using information from local farmers about the average practices per cropping system.

Ideally, the collaborator's farm size should be near the average for the zone. Researchers should not request more than 10 percent of the land of a farmer's holdings. Farmers with the largest and smallest holdings should not be asked to collaborate, to avoid bias of scale.

Since the importance of weeding and diseases are often underestimated by farmers while the importance of problems of varieties and insects are often overestimated, we recommend using clusters of simple two-level factorial trials[1] during the first season in order to gain information from farm trials about potentially limiting agronomic factors. These trials may involve some or all of the following: an improved cultivar versus the farmer's variety, a hypothesized optimum level of fertilizer against the level used by the farmer (often zero), a general contact (or soil) insecticide against the farmer's practice (often no insecticide), a general foliar fungicide versus the farmer's disease protection method (often none), and an extra hand weeding or application of an herbicicide versus the typical farmer practice (usually a cultivation plus zero, one or two hand weedings).

Enough farm trials need to be placed in a homogeneous zone to represent its average agricultural potential. FSR teams should make sure that they conduct enough trials to avoid failure of acceptance when the recommendations are extended to the rest of the zone.

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[1] A two-level factorial trial consists of all combinations of two levels of all inputs considered variable in a given trial. A trial with (1) seed variety, (2) fertilizer, (3) insecticide, and (4) planting density, represented as 2^4, consists of 16 distinct treatments. All other variables (e.g., weed control, disease control) would be held constant in the trial.

(5) Harvesting Farm Trials:

Several weeks before the anticipated harvest, the FSR team should arrange with each farmer a harvest time to avoid prematurely harvested trials. Many seasonal observations become meaningless if they cannot be correlated with parcel yields.

(6) Analysis of Trials:

Trials should be designed for joint statistical and economic analysis. The ANOVA and economic[1] analyses should be completed together soon after the trials are harvested, to allow enough time between the analysis for planning next season's trials using all available trial information. Interpretation of the results by the researchers and in-service trainees should be an integral part of any such analysis.

(7) Farm Record Keeping:

If manpower is insufficient to guarantee proper record keeping, this step should be eliminated from FSR. If farm records are kept, frequent contact between the FSR socioeconomist and the record-keeping assistant in each zone is necessary, especially at the beginning of each season. Many unanticipated questions always arise, and decisions on how to handle them consistently have to be made on the spot in the field. Misplaced and misinterpreted data entries also have to be corrected at this time.

(8) Training:

Formal training courses should not interfere or compete with practical farm work, but should complement it. Instructors should show their fallibility and willingness to learn from mistakes. This attitude will affect the trainees, instilling them with more respect for their collaborators and the farmers with whom they work. Those involved in training must foster a correct climate for team work to occur. This climate includes the open interchange of diverse ideas and flexibility of FSR field implementation.

Stress on good field planning and farm trial execution and proper timing is essential. We recommend at least weekly field contact between supervisors and the training group. During trial design, development, implementation and location of collaborating farmers, such contact should occur on a daily basis.

Ideally, training should include both future extension agents and researchers, and be administered jointly by both programs. The benefits to a given group of trainees of working in zones where the local extension agent(s) are competent and have excellent working relations with the farmers are many, including joint research and extension activities.

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[1]The economic analysis can be patterned after the CIMMYT economics manual (Perrin, et al., 1979), and modified to fit the local conditions of the country.

(9) Personnel Issues:

If a country has sufficient manpower, counterparts should be assigned to work with, and learn from, expatriates. More disciplinary expertise and farm-oriented philosophy will remain in the FSR program if counterparts are assigned from the beginning. In addition, counterparts should be aware that they will be expected to carry out the duties and responsibilities of the expatriate when he leaves the program. Countries with severe manpower limitations must place maximum stress upon the FSR in-service training phase and hope that natural disciplinary leaders emerge from the nationals in the program.

(10) Linkages:

(a) Between Research and Extension. Extension agents need to be relieved of some of their mundane administrative duties to be effective co-participants in FSR. Research should not exploit the extension agent only for his contacts and the extra muscle he provides, but rather should accept him as a valuable addition to the FSR team effort. Finally, the relationship between research and extension should be formalized at the national level.

(b) Between FSR Headquarters and FSR Field Unit. The field team should not be physically separated from headquarters, at least until the program is functioning smoothly.

(c) Between FSR Leadership and External Donors. FSR leadership and external donors must agree on the goals and procedures of both institutions, and FSR leadership must have the political support to insure donor compliance.

(d) Between FSR and Regional Programs. Care must be given in developing relationships between FSR and existing regional programs, especially if regional autonomy is highly regarded, and regional manipulation of the national research budget is a political reality. When regional leadership has control over research personnel, it is essential that regional leadership be convinced of the value, goals and objectives of FSR, not just at a national level, but also at each regional level.

APPENDIX: VIVID FSR EXPERIENCES

The original CU FSR researchers were each asked to contribute their most vivid recollections of their experience. This appendix presents these unedited reflections in random order.

Researcher A

1. Lack of professional advancement opportunities. The time required to complete the task was underestimated and the group members saw little chance to progress in the immediate future.

2. Administrative inefficiencies. The continuous frustrations of working under a bureaucratic public organization with its unexpected problems, delays, and faulty logic made the effort very difficult. This was also true for foreign personnel working under the Ministry-IICA arrangement.

3. Lack of definition within the organization. The Ministry suffered from a generalized lack of clear definition as to the roles played by the different levels and groups. Implementing FSR became a series of accommodations and approximations between the central and regional groups. This contributed to the creation of undue wear and frustration, making it impossible to reach completion of the task within the time framework considered initially.

Researcher B

1. More than in other activities, on-farm research places the scientist in a continuous learning situation. On the one hand, the experience is very stimulating; on the other, one is overwhelmed at times by the magnitude and diversity of the farm problems. The necessity for integration into a team is quite evident. The learning experience comes about equally from direct observations, analysis and reiteration of the field problems, and from conversations with the farmers.

2. It is impressive to confirm the natural intelligence and refined sense of observation possessed by countless illiterate farmers. I'll always remember what one of them said: "Peasant farmers are illiterate, but not ignorant." To learn to respect and appreciate this peasant farmer culture is a substantial part of the on-farm experience.

3. Based on this respect, dialogue with farmers becomes open and fruitful. I never encountered the stock phrase, "resistancy to change," in the majority of these farmers. I encounterd more resistance to change among extension and research personnel.

4. These farmers have a proper, traditional culture that integrates them into their environment. The trained agronomists have lost this tradition, and do not always propose a substitute culture which also gives the farmer security. I believe that this feeling of insecurity adversely affects the behavior of the agronomist to accept changes. In-service training contributes, in great measure, to the development of self-confidence in the agronomist, and to the integration of the traditional and the universal cultural technology which had previously been perceived of as being divorced and incompatible by the agronomist.

5. The integration of a multidisciplinary team is a long and difficult process. The high degree of specialization and individualism in traditional research contributes to this difficulty, as do the existing methods employed in the evaluation of research work. I believe that sometimes we worked as a team, learning from one another, and the total work accomplished was greater than the sum of each individual's effort. Perhaps we only lacked time to form a real multidisciplinary team.

6. I was also very impressed by being involved in and following the process of a very positive change in some of the young agronomists who went through the in-service training program. Their progress and enthusiasm was one of the most gratifying of all the work experiences.

Researcher C

More stress should be given, from the beginning, to true integration during FSR implementation. This is especially critical for non-traditional disciplines, such as agricultural economics, rural sociology and anthropology.

Instability in agricultural research organizations makes research continuity problematic, but renders FSR even more difficult because it requires a longer political timeframe than traditional research does. Unless the rapid turnover of PNIA personnel is slowed, little continuity can be expected. Without such staff continuity, increasing farm productivity via FSR will be very difficult if not impossible.

All peasant farmers perform field operations only after they determine their own logical priorities. The researcher must be made sensitive enough to assimilate and analyze these individual priorities to arrive at the key technology changes which will also be acceptable to the farmers of a homogeneous zone. The technical, political and interpersonal interactions of multidisciplinary on-farm research are always impressively complex.

Many administrative issues interferred with our work during the CU FSR experience. Frustrations over many well-intentioned national and international laws (e.g., licensing of work vehicles, tied aid funds) put numerous stumbling blocks in the path of FSR work.

Researcher D

Perhaps my most vivid experience in Honduras was my first day planting with Frank Peairs and Franklin Rosales in El Rosario. The field we were given to work with was at 60 percent slope and we wanted to lay out a corn variety trial and an insecticide trial using Aldrin. Three hours later and totally exhausted, we completed our task.

At that point, we were only dealing with the physical difficulties of FSR but it has always stuck in my mind how much more demanding this type of work is than the classical, on-station research. In addition to being physically harder to do, FSR is often less satisfying scientifically as so many factors are uncontrolled and most of the data is generated through casual observation and ad hoc measurements.

Notwithstanding these two personal hurdles to involvement in FSR, there are many advantages. Team research is more fun and usually synergistic since each member brings to the group a different expertise. Many farmers are excellent collaborators, both on the technical and human level and this helps to stimulate the research. Finally, and most importantly, FSR is the most logical research approach to promoting rural development with equity.

Researcher E

1. Marking a trial to be planted in Los Empates, El Rosario with Posner and Rosales is one experience that I'll never forget. Three Ph.D.'s, all who did field problems in graduate school, went to mark three 10 X 10 meter experiments. This took us three hours on a farmer's hillside. Not only is FSR time consuming and strenuous, but more importantly, conventional agronomy training does little to prepare you for FSR fieldwork. In-house training is a must.

2. During a visit from representatives of the Consortium for International Development, Rosales and I were asked to give a brief presentation of our FSR project. Although it seemed almost every day to us, it took us about 6 hours to explain ourselves to a group of three that probably had about 100 years of agricultural research experience among them. This points out just how different FSR is from traditional agricultural research.

3. During a discussion with a representative of CIMMYT about our operations in Comayagua, he told me that the Comayagua Valley was not a "zona maicera" (corn-growing area), and that we shouldn't bother with corn research for that area. I had always thought Comayagua was a corn-growing area. As it turned out, his "zona maicera" was an area with a high per unit area production potential, while mine was one in which a high percentage of the farmers grew corn. Since all of the Comayagua farmers grew corn, I thought corn research to be essential for the area. FSR teaches one to look at an agricultural area in terms of development--improving the farmer's lot in life by solving his actual problems. The more traditional approach teaches one to look at the area in terms of production potential, with little consideration for the farmer's actual needs and desires.

Researcher F

The activities called for in the functioning of FSR are many and complicated. The magnitude of the challenge to the participating technician is increased and considerably more difficult than in traditional research. The responsibility of a researcher goes from a narrow, unilateral focus (e.g., breeding for stalk rot resistance in corn) to a multidisciplinary focus with various possible outcomes.

It is much more stimulating to understand, know and assist in the solution of a common problem that affects the socioeconomics and agriculture of many farmers in the country than it is to solve a genetic problem of a cultivar, as the results of the genetic solution may or may not improve the level of life, production and productivity of the majority of farmers.

Multidisciplinary participation is a must in FSR, and is the most stimulating and interesting concept of FSR. Much is shared and many things learned which are not taught at the university. However, this necessitates a desire to participate, and a flexibility to adapt oneself to the different personalities, situations, etc., which this focus offers.

In-service training to prepare researchers or technicians in FSR has to include the concept of direct and immediate service to farmers and to the agricultural problems of highest governmental priority. Training, trainees and the feelings of the latter, have to be distinguished from that present with traditional research. FSR cannot be a substitute but, instead, must be a complementary ingredient in agricultural research. The FSR technician is a hybrid between a researcher and an extension agent, as fieldwork and daily

contact with peasant farmers and their problems requires it. A great deal of personal effort, logistic assistance and adequate mobility, among other requisites, are necessary to succeed in implementing FSR successfully.

FSR should not be considered as being better than traditional research, because it is not a substitute methodology, but is, instead, an extension of it which incorporates a basic change in the mode of thinking about research method priorities. FSR is the system which most likely will assist in resolving the problem of the link between research and extension.

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