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# COMMUNICATION FOR TECHNOLOGY TRANSFER IN AGRICULTURE (CTTA) PROJECT

## FINAL REPORT

November 1992

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## EXECUTIVE SUMMARY

This final report of the **Communication for Technology Transfer in Agriculture (CTTA) Project** covers the period September 24, 1985 through November 30, 1992. All activities completed under this contract (#DPE-5826-C-00-5054-00) were managed or executed by the Academy for Educational Development (AED), with subcontractors Applied Communications Technology (ACT), Inc. and Cornell University. CTTA was jointly funded and managed by the Bureau for Science and Technology's Offices of Rural and Institutional Development, Education, and Agriculture, and USAID Missions in participating countries.

CTTA was a pioneering effort by A.I.D. to develop a cost-effective, institutionally sustainable approach to technology generation and transfer in developing countries. The approach, which combined farmer-focused technology adjustment with an integrated, coherent information campaign, succeeded in diverse agroecological zones around the world. CTTA tested its approach in the humid tropical lowlands of Indonesia, in steeply sloping and mountainous areas of Honduras and Peru, and in the arid and semi-arid lands of Jordan and Niger.

CTTA set out to challenge several traditional approaches to agricultural development. One was the tradition that agricultural technology is the answer to increasing yields and improving living conditions for millions of families in developing countries. The second tradition was the notion that social progress or development comes most quickly and effectively when developing countries identify and repeat or adapt models of agricultural development from the United States and/or Europe.

CTTA acknowledged that technology and models are important components of agricultural and rural development. However, the project's basic premise was that technologies and models have been disproportionately viewed and promoted as the answer. Instead, CTTA assumed that using technology is the primary issue, not developing technology. The project also assumed that technology transfer models can serve to inform and stimulate, but cannot be applied as templates for success. Rather, in each particular setting, and often in multiple settings within one country, answers must be found that meet the needs of local people as well as those of local and national governments. In this way, sustainable progress can be achieved.

CTTA was about change. No progress can be made in agricultural productivity, for instance without behavior change on the part of many individuals, groups, organizations and institutions, often acting in concert. CTTA focused on behavior change in a practical and cost effective manner. It worked with individuals, groups, and organizations to identify the knowledge, attitudes, and practices that exist and those that need to occur for change to result. It looked at incentive systems, rewards, routines, media, monitoring loops, and other evaluation data. Always, it attempted to build on strengths and reduce barriers.

As such, CTTA did not try to provide the answer. Rather, it sought to work systematically

with existing technologies, policies, and economic conditions and use a standard process to help indigenous people improve their conditions. The approach is client-centered and customer-oriented. Beneficiary needs are at the hub of all activity. Good technology is good, for instance, only if the farmer or businessperson using it labels it that way, not the scientist, or the extension worker, or the government minister.

The key to CTTA's success was not where but how the approach was applied. At the same time, CTTA undertook both farmer-focused technology modification and the design of information dissemination using the principles of social marketing. Thus, when technical recommendations were appropriate for--and accessible to--farmers, CTTA disseminated the techniques widely and cost effectively. Project evaluations documented that the number of farmers reached by CTTA increased significantly. More importantly, the number of farmers adopting the recommended practices also increased dramatically.

In Peru, for example, evaluation results indicated that 64 percent of farmers had heard or read recommendations promoted by CTTA; of which 45 percent recalled them correctly, 48 percent had adopted them, and 33 percent were correctly applying them. The director of CTTA's counterpart institution said that:

> *"[our] experience was that under T&V [Training and Visit] methods, only 5-10 percent of farmers could be reached directly. But with CTTA, you can reach 30-50 percent."*

Moreover, a mid-term evaluation team credited CTTA, in certain locations, for contributing to increase farmer yields 6 percent to 10 percent per hectare versus 3 percent under conventional extension.

In Honduras, results were equally impressive. A summative evaluation found that farmer exposure to technological information promoted through CTTA interventions doubled for corn, beans, and rice producers, and tripled for soil conservation. CTTA support also increased the national extension service's ability to change existing behaviors (practices) of farmers. Pre-post comparisons indicated that there was a 6 percent increase in mean aggregate behavior change among corn producers, a 23 percent increase among bean producers, and an 8 percent increase among rice producers. In addition, there was a 55 percent increase in mean aggregate behavior change for certain soil conservation recommendations promoted by CTTA.

Over the life-of-project, CTTA demonstrated that its process could be adapted or modified based on local conditions while also providing a framework for measuring results locally and comparing data across sites. That the Ministry of Natural Resources in Honduras and the INIPA/INIAA in Peru adopted the CTTA methodology as their own national extension and technology transfer models is testimony to the soundness and effectiveness of this approach to reaching farmers and mobilizing rapid change within resource-poor institutions.

Another positive aspect of CTTA that exemplified its innovativeness and interdisciplinary strategy for improving agricultural systems was its effort to build coalitions among technicians and beneficiaries; that is, among researchers and extensionists on the one hand and farmers on the other. These coalitions together defined the problems and determined the feasible solutions. This participatory, collaborative process not only ensured the relevance of technical recommendations, but helped build critical public-private partnerships that had been previously lacking.

Regardless of the country, CTTA also emphasized in-service training to reorient technicians toward the conduct of their everyday work. CTTA project staff and consultants conducted numerous workshops and training sessions on how to assess farmer needs, how to talk with farmers, how to field-test technologies, how to design informational materials and information campaigns, and how to monitor programs. This emphasis on in-service training both maintained continuity in service and inculcated the approach in agency personnel, thus greatly strengthening the participating institutions.

Ironically, because CTTA was multidisciplinary and integrative, it suffered from low visibility. For some, it was too abstract or process oriented. The experiences gained in Honduras, Peru, Indonesia, Jordan, and Niger, however, indicate that CTTA provides a powerful, effective, and meaningful approach to achieving change in agricultural and rural development.

In an era of changing agricultural directives by A.I.D. and other international donor organizations, it is essential that the lessons learned through projects such as CTTA not be forgotten or discarded. Instead, those lessons should become building blocks for future projects and programs. Proven approaches such as those employed by CTTA must remain viable, visible, and available to all interested practitioners and institutions. A.I.D. should consider taking steps to continue to disseminate and promote innovative means of transferring low-cost, appropriate, and simple agricultural technologies to farmers throughout the developing world.

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# PROJECT OVERVIEW

## Purpose

Throughout the developing world, subsistence and commercial farmers of all kinds need information and technologies to improve their lives. Moreover, farmers must consider variables such as risk, uncertainty, lack of agricultural inputs, drought, pest outbreaks, and other acts of God before adopting any new technology or farming practice. Experience has demonstrated that simply making farmers aware of new productivity-enhancing, environmentally benign technologies and practices will have little impact unless they adopt them and use them properly. Farmers must be persuaded to replace old, inappropriate, or bad agricultural practices and behaviors and instructed in the proper use of new, more effective techniques.

Information about new agricultural technologies and farming practices must be accessible to farmers, disseminated at the proper time in accord with the agricultural calendar, and distributed through the right channel(s). Moreover, such information and instructions must be easy to understand and use. If farmers are to be put this information to use, they must be convinced that such technologies and practices will benefit them and their crops. Regardless of the country, the challenge for resource-poor government agencies responsible for generating, testing, and transferring technologies to smallhold producers is that it must be done in a systematic, sustainable, cost-effective manner.

The **Communication for Technology Transfer in Agriculture (CTTA) Project** originated out of concerns that traditional systems for transferring technology break down in efficiency and affordability when targeting large, diverse, and dispersed populations of farmers scattered across rural areas with highly variable agricultural characteristics. Recognizing this apparent shortcoming of conventional approaches, the U.S. Agency for International Development launched CTTA on September 24, 1985. The project sought to:

- apply innovative approaches for using communication, especially mass media, to support agricultural development;
- develop, test, and demonstrate multichannel communication strategies and methods to increase agricultural technology transfer at costs affordable to developing nations; and
- assist in sustaining project strategies and methods on a national basis.

## Methodology

**Origins of the CTTA approach.** CTTA grew out of the need to systematically influence the practices, and hence productivity, of target populations by using principles and methods from several disciplines. CTTA was founded in the belief that, for a technology transfer process to succeed, it is necessary to first identify the different types of farmers, what they know and do, what they believe and their attitudes to change, other behavioral characteristics, and the problems

that confront them. Equally important, CTTA makes farmers participants rather than spectators in technology transfer. CTTA is farmer- or client-centered.

Building on the successes of other A.I.D.-sponsored development projects--especially those in public health, nutrition, and family planning--CTTA employed a multidisciplinary approach that integrated and applied elements of social marketing, behavior analysis, development anthropology, nonformal education, and communication in addressing the range of agricultural problems encountered by small and medium-sized farmers.

Much of CTTA's innovation is its application of the "marketing mix" or four Ps, namely, **Product** (which might be an idea, behavior, technology, or tangible object), **Price** (monetary or otherwise), **Place** (the expectations, conditions, and circumstances of the users), and **Promotion** (the information outreach function). CTTA also considers **Politics** and **Policies** as key variables that shape or influence the decision making of farmers, government officials, input suppliers, and other individuals or groups involved in technology transfer.

CTTA's marketing orientation is a major departure from traditional or conventional technology adoption/diffusion models of agricultural research, development, and extension. They are linear in nature (Figure 1) while CTTA is consumer- or farmer-centered. CTTA's marketing orientation requires segmenting and targeting specific audiences and using multiple communication channels to disseminate messages about technologies. In addition, CTTA fosters participation, interactive two-way communication, and consensus building among key players in technology generation, adjustment, and transfer (Figure 2).

**Figure 1. Traditional vertical model of diffusion and adoption.**

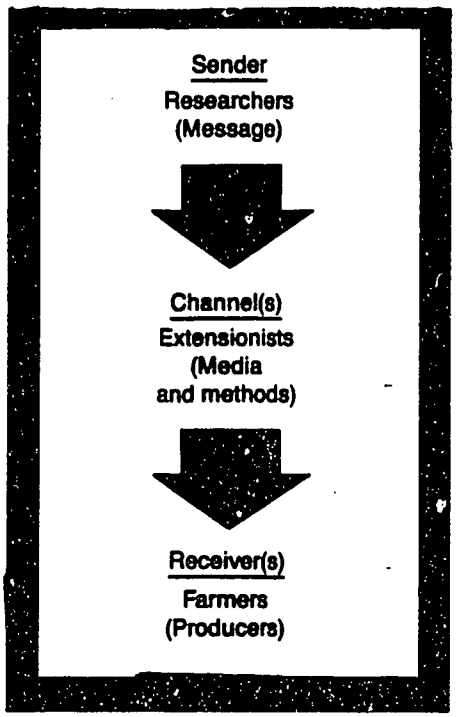
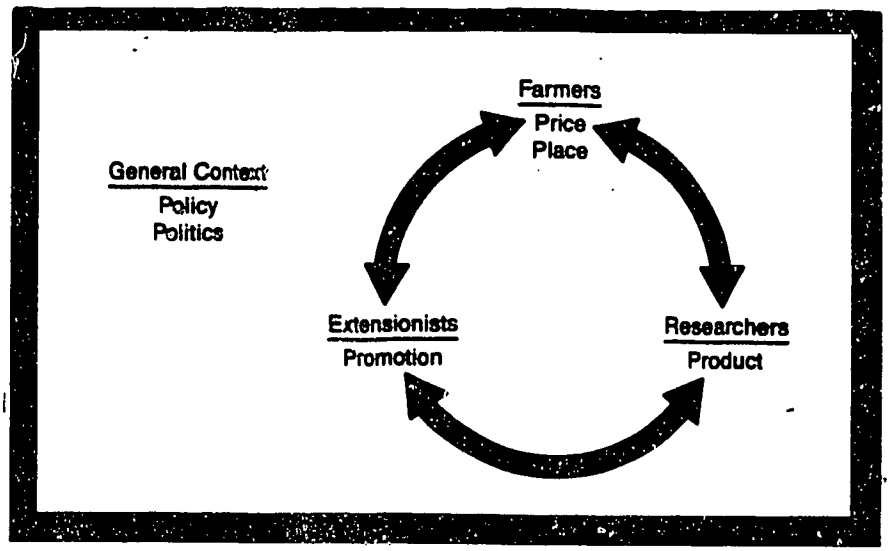



**Figure 2. CTTA interactive model of diffusion and adoption.**



## How CTTA works

At the heart of CTTA is a simple, sequential, and iterative methodology (Figure 3) that always focuses on the farmer. This generic five-step process which has been developed and successfully applied in other development programs, serves as the blueprint for systematically transferring agricultural technologies. CTTA's method considers available resources, particular needs, abilities, interests, problems, and limitations of stakeholders or interested parties to the technology transfer initiative and recognizes both obstacles and opportunities to program implementation.

- **Assessment (developmental investigation).** Assessment employs a variety of research methods to discover farmers' most critical problems, study local practices, and select or adapt alternatives available from research. It examines available media, personnel, and other resources to ensure that technologies and strategies are relevant to the local situation. Further, assessment is the first step in integrating research and extension staff because both organizations provide staff for the studies. This initial step provides a basis for selecting technologies that address the needs of the farmer clients and for designing communication messages appropriate to the users.

  More specifically, assessment consists of the following substeps:

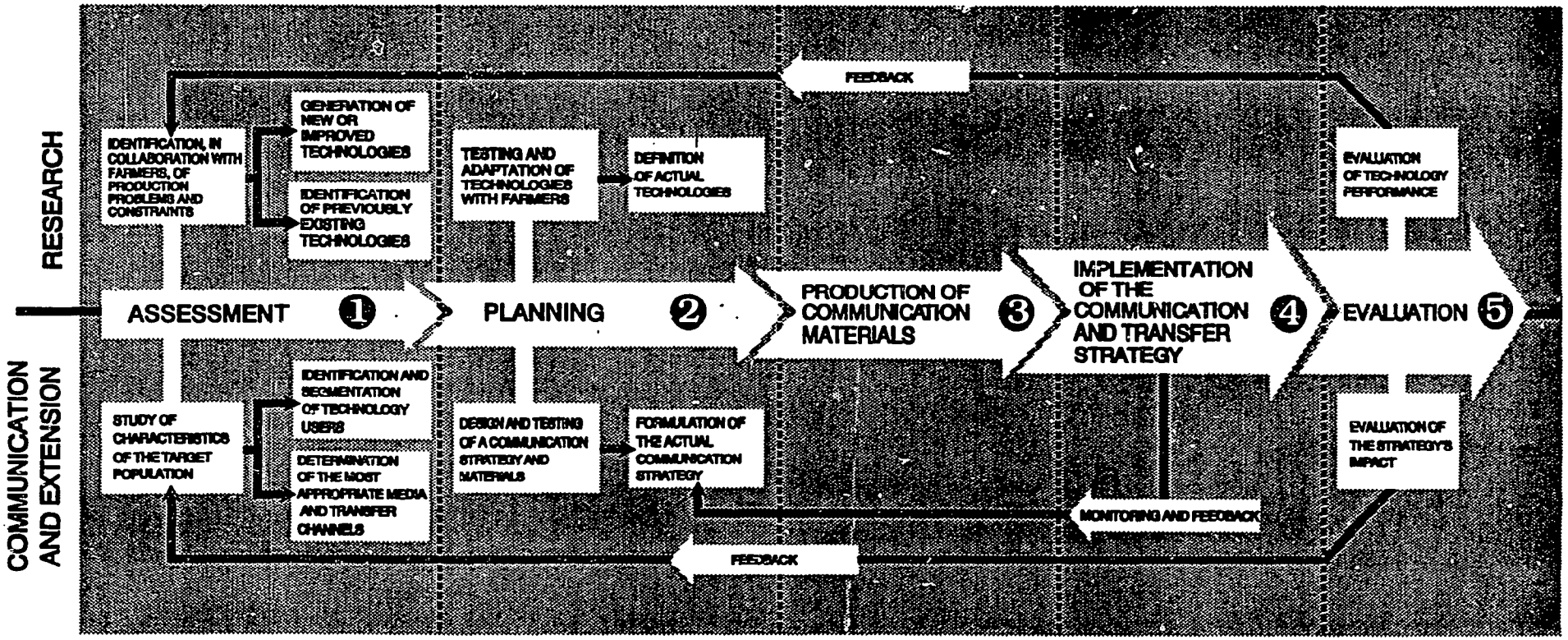
  * Analyze client groups to be served: that is, determine where they live and how they are organized; what they grow and the levels of technology they employ; the problems they encounter in crop production; their social, economic, educational, linguistic, and cultural characteristics; and their preferred modes for receiving information.

  * In consultation with researchers and others, identify available improved technologies. Seek the views of the farmer-client group about the appropriateness of the technologies. This step should involve looking at the potential costs and the economic benefits of using a technology, its ease of comprehension and application, and the risks its entails, especially for low-resource farmers. This step may suggest additional adaptations of known technologies.

  * Gather information about the agricultural sector's support systems so as to determine if the inputs, credit, markets, and other goods and services required to enable farmers to adopt the technology are or can be made available in an adequate and timely fashion.

Figure 3

# THE CTTA METHODOLOGY



- **Planning and strategy development.** Based on the findings during assessment, a comprehensive plan of action is developed. The plan identifies and prioritizes farm communities, crops, and technologies to be included in the technology transfer program. Concurrently, plans are made to test informational materials and channels for future broad-scale dissemination. Training for extensionists and communicators is regularly conducted.

  Once the target audiences are clearly identified, appropriate media for reaching each audience and delivering each message are identified. A comprehensive communication strategy is prepared that outlines the media to be used, including interpersonal farmer-extensionist interactions, graphics and printed matter (manuals, posters, leaflets), and radio broadcasts. Then, information about the targeted technologies is broken down into easily understandable messages that are correlated with the agricultural calendar.

- **Materials preparation and message delivery.** Because crop and livestock production is a multistage activity, messages must clearly and relevantly follow the agricultural production cycle. In CTTA, therefore, both the technologies and the mass media messages are tested at the farmer level to assure that they are appropriate, that messages are understood and accepted by the target audience, and that producers will be encouraged to use the new techniques. Further, because agriculture often is a family affair, information must be reinforced through varying channels that meet the needs of the different family members.

  Subsequently, all materials are carefully pretested and revised according to inputs from members of the relevant target groups. The specific situation--audience, message, medium, guides the method of distribution. Finally, print, broadcast, and interpersonal communication are designed to be integrated and mutually reinforcing. Messages are developed that are consistent from medium to medium and are coordinated to reinforce the information.

- **Implementation.** During implementation, materials and activities that were designed, developed, and tested during the planning stage are set in motion. Radio programs are aired, training sessions are conducted, and printed materials are distributed. Once both the technologies and their associated media messages are validated, printed materials and radio programs are produced for mass diffusion, according to the agricultural calendar. It is during this period that the anticipated change occurs, that is, target audiences begin to change their knowledge, attitudes, and practices related to the techniques being transferred.

  Throughout the process, there is continuous monitoring, which helps the program react quickly to unforeseen problems, such as weather shifts, fluxes in market prices, major pest attacks, etc. Monitoring provides a permanent feedback system for farmers, extensionists, researchers, and other private and public sector actors.

- **Evaluation.** The CTTA process emphasizes the need for periodic formative evaluations to determine if messages are reaching farmers as planned; which channels are attended to most; which messages are being assimilated and which need reinforcement; which technologies and behaviors are being adopted, how they are applied, and with what results; and how farmers' attitudes and willingness to take risks are being changed. Iterative formative evaluations provide rapid and reliable results for immediate decision making and form part of ongoing project management.

  At the same time, CTTA conducts summative evaluations in an effort to quantify the impacts over time of the technology transfer activities. It also seeks to analyze which aspects of each activity have succeeded or failed and to discover reasons why.

## T&V, Conventional Extension, and CTTA Compared[1]

A midterm project evaluation team used qualitative and quantitative measures of output to compare and contrast Training & Visitation (T&V) and conventional extension with some communications support with the CTTA technology transfer process. There are other models, such as the research/extension liaison unit in Ecuador and the contact/neighbor extension programs in Guatemala. These are not included in the comparison because data on their outcome are even fewer than for the three selected modes.

The three models were critiqued according to: ability to change attitudes (confidence, credibility, and motivation); physical outputs (yields, net farm incomes, etc.); ability to change knowledge or capacity among individual farmers, extensionists, and institutional leaders; and technology transfer components. Table 1 summarizes and compares selected output criteria for the three extension models.

**Training and visit (T&V).** During 1987, the T&V technology transfer model was being implemented in more than 40 developing countries on a national or project basis. Major features of the T&V system include a high ratio of agents to farmers; bi-weekly training of field extensionists by subject matter specialists; regularly scheduled visits to contact farmers who, in turn, extend knowledge to neighboring farmers; close supervision by extension leadership; provision of motorbikes and other forms of transport and adequate operational support; and agents' exclusive devotion to extension.

T&V includes a feedback system from farmers to specialists to researchers. The system is flexible in incorporating group meetings, demonstrations, selected communication strategies, and a calendar of problems by crops. In some locations, T&V selects priority communities; and contact farmers in each location are carefully selected as representative change agents.

Benor and Baxter (1984), Feder et. al. (1987), and others reported that establishing and maintaining the T&V system is expensive. Between 1980 and 1985, the World Bank supported

[1] This section is excerpted from the midterm evaluation conducted in April 1989 by Art Coutu, Constance McCorkle, and John O'Donnell.

many T&V systems, with a total cost of approximately $200 million per year. But few developing country extension systems have annual budgets of even 10 percent to 20 percent of this amount.

**Conventional extension.** Conventional extension is generally organized as a division within a national institution responsible for generating and extending agricultural technologies. The extension division operates nationally with regional and local agencies, a corps of specialists, a communications department, modest feedback processes that link extension agents to researchers, a low ratio of agents to farmers, and usually an assignment of some non-educational functions to field extension agents. In most countries, the extension plan calls for national coverage with little prioritization of communities, agencies, or techniques.

Generally, agents have poorly programmed work plans, low salaries, mal-structured career ladders, little operational support, and limited transport. Moreover, they are subject to frequent political interventions and have far lower status than researchers.

In many developing countries, national extension programs are part of national commodity programs. Typically, there is an excessive number of such programs with inadequately trained and supported staff.

**The CTTA process.** The CTTA model starts with a selection of locations following which a needs assessment or developmental investigation is completed; communities, commodities, and relevant technologies are prioritized; a diffusion strategy is developed and implemented; and periodic formative evaluations assess the strategy's strengths and weaknesses. The process provides for continuous feedback and, as part of the diffusion strategy, farmers, extensionists, and institutional leaders receive training. CTTA also includes expert agricultural communicators as equal participants in all components.

Table 1. Preliminary comparisons of selected output criteria for three agricultural extension modes.

| Output Criteria | Extension Modes | | |
|---|---|---|---|
| Process | T&V System | Conventional Extension | CTTA |
| **Attitude Changes** | | | |
| Confidence between farmers and extensionists[1] | n.a.[2] | very modest | very favorable |
| Confidence between extensionists and extension directors | n.a. | little to none | very favorable |
| Confidence between extensionists and researchers | n.a. | very modest | very favorable |
| Motivation of extensionists | n.a. | poor | good to very good |
| Motivation of extension directors | n.a. | poor | good to very good |
| Credibility with farmers | n.a. | modest | very favorable |
| **Capacity Changes[3]** | | | |
| For individual farmers | modest | modest | very favorable |
| For extension agents | favorable | poor to modest | very favorable |
| For regional extension directors | modest | modest | favorable |
| For national extension directors | modest | very modest | favorable |
| **Physical Output Changes** | | | |
| Yield per hectare | + 5.1-13.9%[4] | + 3-6%[5] | + 6-10%[6] |
| Net farm income | n.a. | n.a. | n.a. |
| Quality of physical output | n.a. | n.a. | qualitative evidence |
| Cost/benefit ratios | + 15%-18%[4] | n.a.[7] | n.a. |
| **Comparison of Components** | | | |
| Assessment (developmental investigation) component | none | none | integral |
| Formative evaluation component | none | special studies | integral |
| Feedback mechanism | modest | modest | very favorable |
| Communications components component | partial involvement | partial involvement | integral |

1 Extensionists refers to field or agency-level personnel.
2 Not available (n.a.) from a limited bibliographic search, but ongoing World Bank studies may provide estimates.
3 Capacity changes refers to organized training programs as a component of the overall strategies.
4 Feder et al., 1987.
5 Carrasco, Gutierrez, and Openshaw, 1985 and 1987.
6 Based on verbal reports of findings from the Honduras summative evaluation.
7 Norton et al., 1987, and others estimated internal rates of return to research and extension in Peru ranging from 17 percent to 38 percent under varying assumptions. There are no known estimates of internal rates of return for the extension component.

## PROJECT ACTIVITIES

The CTTA Project began as a five-year initiative in 1985. The project was subsequently extended for two years, terminating activities in November, 1992. This section highlights the major long- and short-term activities undertaken by CTTA and its accomplishments over the seven-year life-of-project. More detailed information on each of the topics presented can be found in project reports (See Annex A for a list of CTTA publications.)

### Pilot Sites

Beginning in 1986, CTTA established long-term pilot projects in four countries around the world. The countries selected to test the CTTA approach to technology transfer were, in order of longevity, Honduras, Peru, Indonesia, and Jordan. CTTA also explored opportunities for establishing pilot sites with USAID Missions in Sri Lanka, Swaziland, Ecuador, Malawi, Morocco, and Thailand. For a variety of reasons, none of these sites ever materialized.

### Honduras

| | |
|---|---|
| Project Start-up Date: | September 15, 1986 |
| Activities Completed: | May 31, 1990 |
| Primary Host Country Institution: | Ministry of Natural Resources (MNR) |
| Other Collaborating Institutions: | Honduran Foundation for Agricultural Research (FHIA) |

CTTA objectives in Honduras were to:

- develop and demonstrate a more effective technology transfer methodology that would provide better quality and greater coverage by the MNR extension service and strengthen the agricultural research/extension and farmer linkages and networks;
- institutionalize the technology transfer methodology within the MNR; and
- diffuse the technology transfer methodology nationally and internationally.

The pilot project sought to:

- promote the adoption of new and/or underutilized agricultural practices among farm families by developing a more effective transfer of technology methodology;

- verify the impact of the transfer of technology methodology through evaluation;
- strengthen the networking methods and procedures to improve linkages among research, extension, other providers (e.g., input suppliers) and the farmer;
- institutionalize the technology transfer methodology developed through the pilot project within the MNR; and
- disseminate project findings to the professional community both nationally and internationally.

**CTTA scope of work.** As outlined in the Letter of Understanding signed by the Minister of Natural Resources and the USAID/Honduras Mission Director, CTTA was to perform the following activities:

- develop a transfer of technology methodology to support extension and associated programs in the transfer of appropriate agricultural techniques to farmers;
- institutionalize the transfer of technology methodology within the MNR;
- strengthen the MNR's Department of Agricultural Communication (DCA) to help it support technology dissemination from the MNR research units to subsistence and small commercial farmers;
- supply basic communications equipment for the DCA in Tegucigalpa and the pilot project headquarters in Comayagua as necessary for project implementation; and
- conduct on-the-job training for MNR staff in DCA and the pilot region, and from other regions.

**Developing and implementing a new agricultural technology transfer approach.** One of CTTA's most important achievements in Honduras was to develop and implement a new transfer of agricultural technology approach that overcame many of the traditional problems of the existing national extension system. By 1988, this methodology was fully incorporated into the MNR's Unified Methodology for Services Delivery. Today, the approach is being used not only in the pilot site--Comayagua--but also in five other regions.

Before CTTA, Honduras used a top-down extension planning approach that emphasized the number of field activities to be completed. There was minimal farmer participation; interaction between agricultural researchers and extensionists was rare; there was scant use of communication media, such as radio and print materials; and technical and methodological training for agricultural researchers and extensionists was limited and inappropriate. Extension services were poor and farmer yields-per-hectare were very low.

CTTA addressed these deficiencies. It integrated agricultural researchers, extensionists, and farmer clients into a cohesive technology transfer team. In particular, CTTA paid special attention to farmer participation in developmental investigation (diagnostic survey), programming, implementation, and evaluation. Moreover, it used a combination of individual, group, and mass media--especially radio, graphic, and printed materials--to improve coverage among rural families and to improve the teaching and learning of new technologies. Very importantly, it took previously uncoordinated activities and resource allocation decision making and arranged them in an orderly, efficient sequence.

The approach also entailed disciplined and realistic extension work plans and allowed for rapid adjustments in transfer activities in order to deal with shifting conditions, such as fluctuations in the price of agricultural inputs and pest and disease attacks on crops. According to the CTTA midterm evaluation, a corollary of these activities was marked improvement in extensionists' self-confidence, motivation, and job performance. Improved extension performance, through employing the CTTA approach, also translated into increased farmer appreciation of, and confidence in, extensionists.

**Institutionalizing CTTA within MNR.** Hernandez (1988) studied CTTA's institutionalization in Honduras from February 1987 to December 1988. Hernandez found that CTTA had introduced significant, positive changes in extension function in the Comayagua pilot region. He found institutionalization to be most obvious at the local extension office and regional levels, but there were also some significant national level accomplishments. A service delivery methodology, for which CTTA was largely responsible, and which incorporates the CTTA approach to extension, was adopted by the MNR as the national service delivery system.

By the conclusion of CTTA interventions in Honduras, institutionalization of the project approach was well advanced not only within the MNR but also within other institutions such as the Panamerican Agricultural School in El Zamorano. At least four major factors made this possible.

- Beginning with the project inception, CTTA staff and advisors worked closely with the MNR National and Regional Directorate to institutionalize activities.

- Long- and short-term technical assistance devoted much time on training activities to develop a national capacity to continue activities after assistance ended.

- The project was designed to work with local and national resources to assure that project activities would not be discontinued when CTTA technical assistance ended.

- The CTTA methodology was systematically institutionalized: the project first sought to introduce a few core changes; more comprehensive modifications were later introduced.

**Training.** CTTA placed heavy emphasis on training at all levels.

- Training was always guided by the previously identified needs of the participants--communication staff, extensionists, planners, researchers, farmers, etc.

- CTTA frequently used the training-of-trainers approach with good results.

- Training activities were always coordinated with MNR Human Resources Department to avoid duplication of effort.

- CTTA used a variety of training approaches, including seminar-workshops, courses, and field demonstrations. Training was conducted at MNR facilities to reduce costs and ensure participation and replicability.

- CTTA training activities were practical and always used local talent. Of particular importance was the participation of extensionists, researchers, rural correspondents, and communication staff to spread their experiences to other MNR employees inside and outside the pilot region.

- Training was supported by detailed documentation and followed by regular monitoring activities to assure the correct application of the new knowledge and skills by the participants.

In-depth training was provided to staff personnel of each communication section. For instance, those who conducted communication research were trained in sampling techniques and statistics; those who adapted technical content were trained in how to define behavioral and educational objectives and text preparation; and radio producers were taught different radio production techniques.

Extensionists received instruction in developmental investigation; design, implementation, and evaluation of the technology transfer projects; communication planning; media selection; use of individual, group, and mass media; group dynamics; and technical writing.

**Strengthening research-extension-farmer linkages and networks.** CTTA emphasized the importance of a close, well-established relationship among the key players in the agricultural technology system. Due in part to its client orientation, the CTTA method facilitated and strengthened linkages among farmers, extensionists, researchers, and communicators in Honduras. Integration began in the Comayagua region with the identification of the existing farming production systems in a particular area. Then farmers' knowledge, attitudes, and behavior regarding certain agricultural practices and problems identified by farmers were determined. The project found that it is only through cooperation among farmers, extensionists, researchers, and communicators that current and potential agricultural production problems can be determined and analyzed and solutions found.

In all Comayagua extension offices, and later in the CTTA expansion areas, there were several good examples of integration. In Siguatepeque, for example, farmers had been using several insecticides to control "Palomilla" (*Plutella Xilostella*). Usually, the insecticides and doses used were detrimental to human beings. Cases of people who had become ill after eating contaminated cabbage had been reported to the Ministry of Health. Working together, extensionists, farmers, researchers, and communicators identified, analyzed, and prepared a project to improve farmers' knowledge, attitudes, and behavior regarding the control of this pest with a new insecticide, DIPEL, which does not harm humans.

CTTA also strengthened linkages by establishing the Rural Correspondents Network radio program. Community members selected a representative--man, woman, or youth--who worked as a volunteer link between the community, the extension agency, and the agricultural radio programmers. He or she asked other community members about their information needs

regarding new agricultural practices and problems with crops and animals. Answers were prepared by the extensionist and broadcast via radio program.

As expected, some farmers' questions elicited no easy answers from either the extensionist or the agricultural researcher. In these cases, the search for a solution was extended to other agricultural research sources, such as FHIA, the Panamerican School, or the International Research Centers. Depending upon the nature and importance of the problem, new agricultural research projects might be established to serve farmers' needs. An evaluation of the Rural Correspondents Network revealed that it strengthened the MNR's capacity to transfer agricultural technology.

**Design, organization and implementation of the communication unit.** When project implementation began, the MNR did not have a communication unit. For this reason, the first step was to organize the Agricultural Communication Department (ACD). Once established, ACD acted as the MNR unit in charge of implementing the project. It was organized into four sections, according to function:

- communication research,
- adaptation of technical contents,
- media production, and
- documentation and information center.

Communication research staff conducted developmental investigation to define appropriate communication strategies for a particular setting. Studies sought to identify farmers' knowledge, attitudes, and behavior regarding new agricultural practices. Staff in the adaptation of technical contents section collected agricultural research results and recommendations from researchers and

adapted them in popular language for men and women farmers. The media production section produced printed audiovisual materials and radio programs, following a series of steps including pretests with representatives of the intended audience. Staff of the Agricultural Documentation and Information Center (CEDIA) distributed materials produced by the MNR. CEDIA offered all the regular services of an agricultural library.

Specific projects at the national and regional levels were outlined for each of these sections. Adopting a management-by-objective approach permitted the project to train and use the scarce human resources in an efficient manner. At the regional level, ACD's office in Comayagua was organized similarly to the national offices, with one representative per section. During the project, personnel trained in the Comayagua office later assumed responsibility for other regional ACD offices.

**Training agricultural students in the CTTA approach.** Honduras does not have a national rural communication faculty for agricultural communicators. Therefore, the country depends heavily on training agronomists, engineers, and journalists in order to conduct its agricultural technology transfer programs. Considering this situation, and to facilitate institutionalization of the CTTA approach, the project coordinated activities with the Panamerican Agricultural School (EAP) in El Zamorano and the National School of Agriculture (ENA). These institutions graduate more than 70 percent of Honduras' extensionists and agricultural researchers. Moreover, the CTTA field director promoted the CTTA approach among other educational institutions in Honduras, such as ESNACIFOR (Escuela Nacional de Ciencias Forestales).

Work with EAP's extension teachers and students not only prepared them to use the CTTA approach from a methodological perspective, but also facilitated the EAP rural development programs in several communities. CTTA staff trained extension teachers and students of ENA in the CTTA approach in 1988 and 1989. However, in 1990, political changes within the institution stopped CTTA activities with extension teachers and students.

It is important to mention that some students trained by CTTA, both at EAP and ENA, became regular ACD employees; others became involved in agricultural research or extension activities within the MNR extension service or other public and private institutions.

**CTTA expansion.** Despite CTTA's short life, its activities spread to new MNR areas, thanks to results obtained in the pilot site, the dedication of CTTA personnel, and the support of MNR officials. CTTA initiated activities in the MNR Comayagua region in September 1986 in three extension offices. One year later, the project initiated activities in two more offices; and by March 1988 the project was active in the remaining five extension agencies of the region. As more project personnel were trained, CTTA extended its activities to the region of Olanchito, in coordination with the MNR departments of agricultural research and extension.

In 1990, CTTA was active in Comayagua, Danli, Olancho, Olanchito, Litoral Atlántico, and the Northern Region in San Pedro Sula. These are the most important agricultural production regions of Honduras, where most basic grains are grown.

**Disseminating CTTA Project findings.** CTTA disseminated its findings nationally and internationally. At the national level, project findings were shared with extensionists and agricultural and social researchers working in the MNR, in agricultural universities, and in USAID/Honduras. Dissemination of CTTA activities was through national and regional seminars, workshops, lectures, meetings, and print and audiovisual materials. CTTA also produced a 14-minute promotional audiovisual, with versions in English and Spanish. A list of the CTTA/Honduras publications appears in Annex A.

At the international level, CTTA personnel lectured (and distributed CTTA graphic materials) at the *First International Symposium on Farmers' Participation in Agricultural Research and Extension*, held in October 1989, in Tegucigalpa. The CTTA field director also participated at the *Mobilizing Agricultural Technology to Meet the Central American Challenges Seminar*, organized by IICA in San José, Costa Rica, during March 1990. Finally, the CTTA field director in Honduras participated in a round-table discussion on *Farmers' Participation in Agricultural Research and Transfer of Agricultural Technology* during the Farming Systems Symposium in East Lansing, Michigan, in October 1990.

**Support to other USAID/Honduras projects.** CTTA enjoyed a close relationship with other USAID/Honduras projects such as Proriego, MIPH (Manejo Integrado de Plagas en Honduras), and the UDA (Unidad de Adaptación de Tecnología). In particular, CTTA helped Proriego design and implement its national promotional campaign; produce and distribute graphic, printed, and audiovisual materials; and conducted communication training for staff and extensionists.

CTTA assisted EAP's MIPH Project to disseminate information about new agricultural practices related to basic grains pest prevention and control. Through such cooperation, MIPH spread its messages to many more farmers around the nation and CTTA found a permanent source of technical information about farmer concerns. The CTTA and UDA Projects cooperated to promote and disseminate new, appropriate technologies to men and women farmers. Several graphic materials were pretested and produced. In addition, CTTA helped these and other USAID/Honduras projects through disseminating several how to communications training manuals and bulletins.

**Other CTTA achievements.** Beyond the key accomplishments described above, other important CTTA achievements included the following.

- CTTA not only served basic grains and vegetables farmers, but also worked with the MNR General Direction of Livestock. The CTTA approach was adopted to help prevent

and control cattle parasites such as "garrapata" (*Boophilus sp.*) and "torsalo" (*Dermatobia Hominis*).

- CTTA supported all MNR actions to protect natural resources. In particular, CTTA personnel helped design and implement annual national communications campaigns devoted to forest and water resources protection.

Peru

| | |
|---|---|
| **Project Start-up Date:** | **1986** |
| **Activities Completed:** | **September 30, 1990** |
| **Primary Host Country Institution:** | **Instituto de Investigación y Promoción Agropecuaria (INIPA) which later became Instituto Nacional de Investigación Agraria y Agroindustrial (INIAA)** |
| **Other Collaborating Institution:** | **Fondo de Desarrallo del Agro (FUNDAGRO)** |

CTTA objectives in Perú were to help INIPA/INIAA develop, apply, and verify a methodology for designing and managing collective communication strategies for agricultural technology transfer. These strategies employed media such as radio and graphic and printed materials, and interpersonal communication techniques.

CTTA sought to:

- develop and test a methodology to design, apply, and maintain strategies of communication to support technology transfer programs that could be continued by the Peruvian Government after the end of the project; and

- institutionalize the methodology developed at pilot site to the extent that it could be extended to other regions.

INIPA selected Huaraz as the pilot region. In January 1987, the INIPA regional authorities, with the director of technical communication and extension programs, selected the sector of Macará for establishing pilot activities. Focus crops were potato, maize and wheat.

**Developmental investigation.** During February 1987, CTTA conducted formative research in the pilot area. Field personnel, consisting of local university students in agricultural engineering and staff of the Superior Technology Institute surveyed 252 farmers. Further information was collected through focus groups and in-depth interviews with 50 farmers. All surveys and other investigative methods were conducted in the local language, Quechua.
Results showed that 36 percent of heads-of-family were illiterate, but that 88 percent of the families at least one person knew how to read. About 85 percent of farmers interviewed had access to radio. Eighty percent said they did not receive any technical assistance. Only 9 percent received technical assistance from CIPA (INIPA). Forty percent of farmers in the pilot zone tilled less than 1 hectare, usually subdivided into noncontiguous parcels. Survey respondents said that crop insect pests and diseases were priority production problems. It also became apparent that farmers improperly prepared their land for cultivation; selected and planted low quality seed; and did not properly perform practices such as hilling, irrigation, and fertilizer application. Among the most important maize pests were the Spindleful Worm, the Shoot Worm, and the Land Worm. Papa-Kuru and the Piki-Piki also were described as problems. Of the diseases mentioned, the most common was Roya in wheat, and Racha in potato.

The research revealed a heavy dependence by farmers on chemical fertilizers and pesticides. Farmers also were observed to improperly execute cultural practices such as land preparation, hilling, plant spacing, seed selection. Therefore, INIPA and project staff determined that changing or improving each of these behaviors might substantially increase food production. Based on the research findings, two sets of recommendations were developed: one set promoted techniques that would not require agrochemicals, such as soil preparation, seed selection, hilling, irrigation, etc.; the other set promoted practices that would require some type of chemical product, such as a fertilizer or pesticide.

**Integrated action plan.** In May 1987 an integrated plan was prepared for Huaraz that outlined a step-by-step to implementing the intervention. The plan divided the strategy in two general stages. In the first, agricultural messages would be disseminated via radio and as print and graphic materials. The first phase of the intervention set out to:

- test the technologies, their validity, and the ability of farmers to use them properly;
- adjust the technologies to respond to the characteristics and management styles of farmers;
- verify the effectiveness of communication techniques;
- assess mechanisms for materials distribution, and
- evaluate feedback mechanisms and overall impact.

Using results from the first stage helped formulate a second technology transfer stage that included complementary and mutually reinforcing communication materials, group training,

demonstration plots, and the introduction of techniques that had been adapted and adjusted by the farmers who would use them. Stage two also added communication and broadened the use of existing channels to increase coverage.

### General Strategy Design

Technical Contents. Based upon findings during strategy development, the Peru staff (CTTA, researchers, extensionists, farmers) identified a set of improved technologies to be promoted for each crop. For potato, for example, techniques such as the following were chosen:

- land preparation before sowing,
- seed selection and disinfection,
- planting distance by variety,
- fertilization,
- proper hilling (tillage) techniques during cultivation,
- insect pest control,
- disease control and prevention,
- seed selection at harvest, and
- storage.

Similar groups of technologies and techniques were identified for the other focus crops--maize and wheat.

Communication Channels. Selecting the most appropriate communication channels depended not only on the results of the farmer surveys, but on the availability of an extensionist within a zone

and of the operational capacity of the Technical Communication Office (OCT) of CIPA (INIPA) in Huaraz, which was responsible for executing the project.

CIPA only had a mimeograph machine and a small radio recording booth. Before CTTA, the office was already producing some graphic materials for diffusion for technicians and farmers and a 20-minute, weekly radio program that broadcast institutional information and agricultural advice. After an analysis of the situation, project staff decided that graphic materials that were easy to produce and comprehend would reinforce radio programs. Eight-five percent of farmers

had access to radio and 88 percent of farm families included a member who could read. Developmental investigation had also shown that graphic materials were the most requested (73 percent) form of agricultural information, because the information could be kept and consulted when necessary.

Although OCT was already using radio and graphic communication, its approach was traditional and conservative. Some obvious problems included complex institutional formats, informational inconsistencies, and information requiring high literacy, all of which reduced farmer understanding. In addition, too few copies were often printed to adequately reach and serve farmers.

Personnel Training. Once the technical and communication problems were identified and appropriate solutions proposed, it was essential to develop and disseminate uniform technical recommendations for the farmers. Therefore, specialists in potato, maize, and wheat prepared simple technical guidelines for extensionists to use while working with farmers. Technical guides were published for each crop and distributed to technicians and extensionists throughout the region. The guides gave the extensionists the latest information for each crop, as determined by the regional experimental station.

Three workshops were organized in Huaraz to train the technicians of INIPA/Ancash and other local institutions in the CTTA methodology. Each employed a variety of pedagogic materials and techniques and lasted several days. Workshop titles included *Basic Techniques in Social Research*, *Educational Broadcasting Techniques*, and *Design and Validation of Educational Graphic Materials*. Each workshop included both local participants and representatives from other agricultural regions in the nation, hence helping to institutionalize the project methodology.

**Implementing the Strategy.** The first stage sought to validate technologies, validate and evaluate survey codes and communication channels, and adjust technologies, as necessary, for continued promotion. Among the information disseminated during the first stage was:

- how to obtain a soil sample,
- how to plant maize,
- how to fertilize maize,
- hilling and second fertilization of maize,
- how to mix and use pesticides,
- how to control Potato-Kuru and other potato-related pests, and

- how to control *Pulgón* in wheat.

Flyers were distributed to explain how to use each technology being promoted. The flyers reinforced 20- and 30-minute radio broadcasts that promoted the sample techniques. CTTA and INIPA staff worked with the farmers on communal parcels of land to test the new technologies and analyze their potential and appropriateness. Lessons learned while tilling communal plots were immediately disseminated through radio and print materials, thus allowing farmers to employ them while cultivating their individual plots.

Project staff, together with extensionists from the pilot area, would visit communal lands where groups were working. There, they would explain the proposed technology for the particular crop and moment in the agricultural cycle. Farmers were invited to use the technology in a small area of the parcel, and with CTTA staff, analyze the ease or difficulty of application and suggest how the practice might be improved. A graphic artist occasionally accompanied project staff on these field visits to document the farmers using the new technology for later use in promotional materials.

Farmer input was critical to ensure the information was properly and accurately presented and easy to understand. Initially, radio messages were broadcast in Spanish; however, as a result of the farmer feedback, radio began to use both Spanish and Quechua. Eventually, Quechua became the primary broadcast language.

Two characters were created for the radio programs: Don Hilaco and Juanaco. Don Hilaco was an extensionist and Juanaco was a typical farmer who shared his doubts, problems he regularly encountered, and his interest in improving life for his family. Each program consisted of a comprehensive conversation, in Quechua, about a specific topic. Script-writers were careful to fully and accurately represent both the farmer and extensionist points of view. Careful attention was paid to matching print information with what was broadcast. In addition to longer broadcasts, short radio spots broadcast six times daily, continued to promote and explain the application of new techniques.

**First Formative Evaluation.** In December 1987, the project conducted its first formative evaluation. Ten field investigators surveyed 184 heads-of-family in five communities in the pilot area. The survey was administered in Quechua. Knowledge, recollection, and reported adoption of the following messages that had been disseminated were recorded; planting, planting density, fertilization, and pest control for maize; soil preparation and pest control for potato; and soil analysis techniques.

Results indicated that 51.7 percent of those farmers surveyed had heard or seen the recommendations, 35.2 percent correctly recalled the recommendations, 37.2 percent reported adoption and 25.8 percent used the techniques correctly (see Table 4 in Research and Evaluation, page 66).

The formative evaluation also identified some problems related to information dissemination. For example, some flyers did not arrive on time and there were not enough to meet the demand. Notwithstanding, the flyers were given favorable marks by farmers for their easy to use format and usefulness. As a result, of findings during the evaluations, CTTA re-designed the way it distributed graphic materials and adjusted the broadcast times of the radio spots. Distribution points where farmers could pick up flyers and other print materials were announced over the radio.

**Implementing the Second Stage.** The first stage demonstrated that radio could effectively reach many farmers. Graphic materials, despite distribution problems, also were popular among farmers. A group training component needed to be added to increase extension agents' abilities to communicate improved techniques and interact effectively with farmers. Based upon results and experience gained during the first stage of implementation, the second stage sought to design, execute, and validate an effective technology transfer strategy.

The second stage employed the following approaches and transfer techniques.

- Graphic crop guides, based on the original flyers were developed as techniques were validated for each crop stage.

- Twenty-minute radio programs explained each of the lessons described in the guides.

- Community training, which incorporated tapes of radio programs and graphic materials, and included researchers, extensionists, and farmers, helped address farm-level issues from several different perspectives.

- Demonstration plots were established in each community for each crop, so that farmers could observe, practice, and test the validity of each proposed technology.

- Increased interpersonal communication among farmers and extensionists. Extensionists participated in community training, guided the establishment of demonstration plots, and continued to make individual farm visits.

All messages in all communication materials were complementary and reinforcing. For example, print and graphic materials illustrated the sequence of behaviors in which each technology was to be replicated, radio was used to explain each step and discuss each print description. Three *Learning Guides* (maize, potato, and wheat) were designed, based on earlier sets of flyers. In addition, each guide also included a self-evaluation sheet for the user to complete. Don Hilaco and Juanaco discussed topics from the *Learning Guides* at the appropriate time in the agricultural cycle.

Community leaders were asked to assemble groups of farmers for training sessions. They also were responsible for introducing the idea for such training to the community and setting training

dates. After a training session had been conducted, participants were encouraged to discuss, among themselves and with the extensionist, what they had just studied. Often, after lecture and discussion, the training group would move to a nearby field and practice what they had just learned. Project staff recorded the comments and questions of the participants during the training and field exercises, and used their observations to make necessary adjustments.

**Second Formative Evaluation.** A second formative evaluation was conducted in 1989, in four communities. One hundred seventy-eight farmers were interviewed, representing more than 10 percent of 1,500 families that lived in the area. The second evaluation sought to determine the levels of program coverage, correct recall by farmers, and adoption and correct use by farmers of the 17 technologies that had been promoted. Interviews were conducted in Quechua by 11 surveyors selected from the local university and technology institute.

Results indicated that 63.6 percent of farmers had heard or read the recommendations; of which 44.8 percent recalled them correctly, 48.4 percent had adopted them, and 33.3 percent were correctly applying them. (See Table 2, p.59). The results showed significant improvement in adoption and use as related to those of the first evaluation. In several instances the new process was shown to perform better than the traditional extension system used by INIPA. One of the most interesting results related to the channel used to disseminate information. Although radio continued to be the medium of greatest coverage, graphic material was seen as increasingly more useful, confirming that the channels of distribution were functioning more effectively. In addition, interpersonal communication among neighbors, friends, and relatives was identified as a powerful conduit for new ideas and technology transfer.

**Summary of the Communication Strategy.** The communication/technology transfer strategy developed in Huaraz consisted of integrating mass media such as radio and highly illustrated print material for farmers to study individually. Modules were designed and distributed according to the agricultural cycles (agricultural calendars) of each crop. The distance education modules were complemented by group training, which introduced new techniques at the beginning of the agricultural cycle. In each community demonstration parcels were established in farmer fields. New or improved techniques were implemented on those parcels, making it possible for interested farmers to compare results or old and new practices. In addition, local extensionists used the demonstration plots for community training.

Feedback was obtained in a variety of ways. Information was acquired directly from farmers during group training, during farmer visits to demonstration parcels, during meetings with technicians and project personnel, and through owners of demonstration plots. The later group often acted as key informants for adjusting and adapting new techniques, and were trained to serve as correspondents from their communities. Information gathered from the various feedback loops was used to fine-tune the ongoing transfer programs.

Applying this strategy has many advantages, following which are some of the most important:

- The relatively low cost of the approach allows it to be implemented within existing institutional structures and budgets. For example, many extension units already employ some form of radio programming and print production and distribution.

- Extensionists' work is systematized and consistent with information disseminated via other means.

- The availability of timely, practical technologies motivates farmers to test and adopt them.

- The feedback mechanisms allow for adjustments and mid-course corrections in programming. Technologies can be adjusted and adapted according to changing circumstances or conditions.

- Results of formative evaluations and impact evaluations at the end of the agricultural cycle can be used to systematically plan the achievement of project goals.

- Using mass media allows for broad diffusion of information such as changing prices, availability of raw materials, marketing movements, and new regulations that are of interest to farmers.

**Expansion of CTTA.** In 1988, based on successful completion of the first stage of the strategy developed in Huaraz, INIAA chose to implement the project methodology in two additional regions to learn if it was replicable. The expansion areas were the Experimental Station of Vista Florida in Chiclayo, representative of the northern coast, and Illpa in Puno, which represented the southern highlands of the Altiplano.

In Chiclayo, where rice was the traditional crop, INIAA hoped to introduce new, less water-dependent crops. In Puno, INIAA hoped CTTA could support the PISA (Research Projects of Andean Systems) and PAL (Alpaca) Projects.

The same process as was developed and tested in Huaraz was introduced in both regions. Each would design its own strategies according to its realities and needs. In both regions, pilot areas were selected in which to perform the research and test the strategies.

**Puno.** An implementation plan was developed for Puno in 1988. A work schedule established the steps that would be followed while designing and testing appropriate techniques to transfer to farmers. The implementation plan included a chronogram of activities based on the agricultural calendar for the focus crops and livestock. The plan also characterized project communities, proposed an activity schedule, and estimated a budget. Two provinces and eight communities were chose to participate in the intervention. Farmers from communities served by the PISA project cultivated mainly potato and cereals (oats, barley, and quinoa). PAL

communities consisted mostly of alpaca breeders. Similar sets of technologies as those chosen in Huaraz were identified for adaptation and transfer.

Initial developmental investigation was conducted through interviews with 237 heads-of-family selected from 2,208 families from 11 communities in the pilot area. Interviews with key informants and focus group interviews also provided information.

As in Huaraz, radio was identified as the most appropriate channel for reaching farmers served by the PISA Project. Radio was almost the only way to reach alpaca breeders because they were so scattered and migratory. Cereal and potato farmers could also be reached by extensionists.

Following developmental investigation, the same strategies and processes were used to implement programming in Puno as were simultaneously being introduced in Huaraz.

**Chiclayo.** Four similar agricultural sectors in Chiclayo, located within the Mochumi Extension Agency district, were chosen as a pilot area to represent the northern coastal ecology. The zone has 13,900 inhabitants, 65 percent of which live in rural settings. Implementation began in November 1988.

Limited water for crop irrigation was identified as a major problem for farmers throughout the pilot region. Hence, farmers were being encouraged to seek other crops with more moderate water requirements. At project initiation, the pilot area included 1,805 production units on 9,076 ha, of which 48 percent were planted to rice and 47 percent to other crops, mainly maize, sorghum, and legumes.

Local researchers reported that major production problems in the region were inadequate land preparation, improper seeding density, low and incorrect fertilizer use, lack of pest control, and high soil salinity because of improper water use. Technical recommendations for three crops--hard yellow maize, sorghum, and legumes--were prepared based on these findings.

During December 1988, 180 farmers (representing about 10 percent of the farm units in the pilot zone and 20 percent of farmers who cultivated the target crops were interviewed. These data were used to formulate a technology transfer program. A similar process was followed as was being implemented in Huaraz and Puno. Programming incorporated the reinforcing use of radio, highly illustrated print materials, demonstration plots, and increased interpersonal communication among farmers, extensionists, and researchers. In the pilot zone, efforts were made to coordinate with the irrigation and production committees to distribute graphic materials and develop training courses. Personnel from the Research Projection and Technical Diffusion Office and maize, sorghum, and legume specialists from the Vista Florida Station also were trained to use the CTTA methodology.

**Institutionalization.** In September 1989, AED negotiated new terms of reference with A.I.D. to continue providing CTTA technical support through July 1990. During this period, the role of the CTTA advisors was to help INIAA further institutionalize the technology transfer process and extend the CTTA approach to new regions. This was to be achieved by training personnel from regional research stations in the CTTA methodology, helping to set programs in motion, monitoring activities, and providing technical assistance as needed. A technical manual was also to be written to facilitate the training of INIAA personnel. The new terms of reference called upon the CTTA advisors to support FUNDEAGRO through the TTA Project (also funded by USAID/Peru) to encourage private sector technology transfer efforts, encourage the development of new production systems, and to certify and distribute improved seeds.

Beginning in June 1989, INIAA expanded the CTTA methodology to include nine additional research stations around the nation. To ensure efficient management of the expansion and comprehensive institutionalization, it was necessary to:

- determine personnel needs for each station that would reflect its particular institutional strengths and weaknesses;
- train station personnel in the CTTA methodology;
- ensure that adequate funds were available to implement the activity in each zone; and
- establish a system for supervising and monitor the development of activities at the different stations.

Station personnel were trained by CTTA advisors during two workshops, *Research Techniques for Strategy Development* and *Techniques for Designing the Technology Transfer Strategy and Communication Materials*. Each workshop was attended by 15 Research and Technical Service Directors.

During the first workshop, participants practiced how to formulate technology transfer plan, including selecting a pilot area, identifying focus crops, etc. Participants also designed research instruments (questionnaires, interviews, guides, etc.) that would later be used to conduct site-specific formative research. Participants brought the results of this research to the second workshop, where they used it to formulate strategies for their zones, prepare project budgets, and design a first generation of supporting communication materials.

In February 1990, in Huaral, project staff gave a new, week-long workshop titled *Technology Transfer and CTTA* was held. The workshop was attended by 20 directors from research stations across Peru. At this final workshop, participants reported and justified their work plan and budget for 1990 activities and discussed each development plan. Thereafter, CTTA advisors maintained close contact with the participating stations and helped them to continue their programs.

As part of the institutionalization plan, CTTA advisors produced a manual that described how to develop programs using the CTTA process. Examples were largely drawn from experience in the pilot zone of Huaraz. Other guiding materials were also written.

**Fondo de Desarrollo del Agro (FUNDEAGRO).** Through FUNDEAGRO, a USAID-supported private agricultural research foundation that focuses on private enterprise development in agriculture, CTTA helped strengthen private sector technology transfer. CTTA helped plan five studies on markets and farmer interest for private technology transfer services. The private sector promotion not only sought to increase demand for private services by companies but also helped refine the methods for delivering and evaluating such services. Additionally, CTTA supported improved production systems and seed distribution and certification.

Barriers to using improved seeds were identified and approaches were developed to remove them. A process for monitoring adopters of new seed was implemented, and training also was provided to seed salesmen from several departments.

**Indonesia**

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|---|---|
| Project Start-up Date: | February, 1988 |
| Activities Completed: | April 15, 1990 |
| Primary Host Country Institution: | Department of Agriculture, Directorate General Food Crops Agriculture (DFGFCA), Secondary Food Crops Development Project |

Malang, East Java, was chosen in 1988 as the CTTA pilot communication site. At the site, CTTA sought to refine a methodology for cost-effective communications interventions for transferring agricultural technologies to farmers in Indonesia. Because CTTA Indonesia was attached to the Secondary Food Crops Development Project (SFCDP), technologies were to include (but were not limited to) secondary food crops, especially corn, cassava, soybeans, and other legumes. The terms of reference for the Indonesia communications pilot were to demonstrate the effectiveness and cost efficiency of alternate methods of technology transfer via mass communications and other techniques, involving:

- design and implementation of low-cost effective communication-extension activities on a pilot basis in the East Java kabupatens;

- monitoring these activities and evaluating the impact of the new technologies diffused under the project; and

- expanding effective pilot interventions for technology diffusion to one or more of the new provinces.

CTTA communications pilot in East Java sought to:

- demonstrate cost-effective communications techniques for transfer of agricultural technologies in certain areas for a limited spectrum of important food crops including corn, cassava, and soybeans;

- test communications techniques in areas representative of those which will be brought into production in the forthcoming Indonesia Five-Year Development Plan, in particular dryland or upland areas that are close to or remote from agriculture commodity marketplaces;

- test communications approaches among different economic levels of farmers including, wealthy, cash-crop farmers; resource poor, subsistence farmers; and moderately well-off farmers; and

- train personnel from the Department of Agriculture in the communications approaches to be implemented.

Malang was chosen as the pilot site for several reasons.

- Kabupaten Malang includes a spectrum of agroecologies and economic levels of farmers ranging from economically weak, isolated farmers who cultivate poor limestone soil in an area with a long and pronounced dry season; to somewhat better-off farmers who till young volcanic soils near Malang markets; to well-off farmers who plant vegetables on well-watered uplands. In neighboring Kabupaten Lumajang, farmers plant dryland soybeans.

- Ten private and two government radio stations in the Malang area make it possible to use mass media within the confines of the kabupaten.

- Malang is served by a range of agriculture institutions, including the Balittan Malang (MARIF), which conducts on-farm research in secondary foodcrops; the Balai Teknologi Pertanian in Lawang, which conducts some plant testing; and the Dinas Pertanian in Malang. These research resources, available in several extension regions, made it possible to include reliable, locally pertinent information in CTTA messages.

- There are two BLPPs (agricultural training institutes) in Kabupaten Malang, making it possible to carry out training for wider dissemination of CTTA lessons.

**Developmental investigation.** The first implementation phase consisted of developmental investigation--studying farmers' situations and what might facilitate or constrain their adoption of new farm technologies. An anthropologist conducted a farm family study and the Center for the Development of the Social Sciences at Brawijaya University was commissioned to interview farmers in the three extension agencies chosen as target sites.

Gajahrejo village in Pagak Extension Region was chosen for its remoteness and distance from markets. Pakisjajar village in Tumpang Extension Region was chosen for ease of access and proximity to Malang markets. Ledoktempuro village in Wonorejo Extension Region, Kabupaten Lumajang, was chosen because farmers planted soybeans on dry highland.

Developmental investigation surveys were conducted in local languages -- Javanese and Madurese; information was collected through individual and focus group interviews; and the resulting data base included more than 600 entries of purposive and in-depth information.

The farm family survey identified three important constraints to communicating with farmers:

- **Language.** Farmers were best approached through their local language (Javanese or Madurese), not the national language (Bahasa Indonesia).

- **Income levels.** Most farmers were subsistence farmers with little spare cash to invest in expensive technologies.

- **Media access.** Most farmers had only a radio, very few had television, and most villages had no electricity, thereby limiting the effectiveness of electronic mass media.

The farm family survey also revealed effective techniques for gathering information from Indonesian farmers. Although in-depth interviews were useful, focus groups appeared to be most efficient for investigating what farmers wanted to learn from agricultural messages, for studying farmer preferences, for identifying cultural appropriateness of messages, etc.

Two other surveys contributed importantly to the developmental investigation:

- A radio listener survey, which identified the stations to which farmers listened and was used to determine which commercial stations to commission for programming.

- A kiosk (small agricultural shop that sells seed, fertilizer, pesticides, sprayers, etc.) survey showed what agricultural products were commercially available.

**Radio.** Developmental investigation showed that radio would be a likely medium for getting information to farmers and that MARIF and Dinas Pertanian were sources of information for

dissemination. But, the two did not communicate regularly with each other. CTTA sought to link the two institutions through preparing and broadcasting a weekly radio talk show.

To improve the transfer of vital agricultural information to farmers, the project created the *Serba-serbi Palawija* (Secondary Food Crops Potpourri) radio program. Ten-minute segments included discussions in the low Javanese (Ngoko) language between a MARIF researcher and an extension agent from Dinas Pertanian. Topics focussed on good practices for the present growing season and were based largely on the results of MARIF on-farm research. *Serba-serbi Palawija* was aired five times weekly on two radio stations.

CTTA also produced a series of four-minute "mini-dramas" designed to convey general agricultural messages through short drama formats. For example, a mini-drama about pesticides featured a farmer getting sick and almost dying after drinking water from a pesticide can.

Although no impact evaluation was conducted of either radio program, focus group interviews were carried out to elicit feedback from farmers about both *Serba-serbi Palawija* and the mini-dramas. Findings were used to fine-tune the programming.

**Photonovels.** In addition to radio, the farm family study identified photonovels as an appropriate medium for reaching farmers with agricultural information. Photonovels are similar to comic books, but feature photographs of real people and real scenes rather than comic strip characters.

Pusat Kateketik (Puskat), a nongovernmental organization, was contracted to produce two photonovels -- one for the Pagak Extension Region and one for the Tumpang Extension Region.

The intention was to produce two, carefully targeted photonovels that farmers would enjoy reading and that would provide them with good advice about improved agricultural practices. To ensure that the story in the photonovel was appropriate, a farmers' group was asked to help develop the storyline. Puskat asked farmers what they liked and disliked about comic strips; drew, with farmers, illustrations of farm situations (erosion, pest problems, rising prices, etc.); and used puppets to find what farmers thought should be emphasized in the messages. Agricultural extension specialists also participated in this process.

A total of 12,000 photonovels were printed: 4,000 in low Javanese and 2,000 in Bahasa Indonesia for each extension region. These were distributed in market towns on market days to farmers who were returning home. They were also distributed through the extension service to farmers' groups.

To evaluate the effectiveness of the photonovels, approximately 100 people in each extension region were tested for their retention of information published in the booklets. There was an increase in correct responses for each of the ten questions asked.

**Calendars.** Perhaps the most interesting and possibly the most significant communication approach tried by CTTA was the production and distribution of calendars -- full-sized, highly-illustrated, four-color calendars with targeted and timely agricultural information -- for each of the three extension regions. The look and content of the calendars was developed during a workshop that included participants from the extension services in the three extension regions, MARIF, and from the kabupaten extension office. Participants chose three illustrations for each month. As with the radio programs, the workshop brought together MARIF researchers and Agricultural Service Agency staff to solve a real agricultural problem. Three calendars were produced, 6,500 each, targeted to the needs of the respective extension regions. The calendars were distributed on farm market days, through farmers' groups, and directly from the project vehicle as it drove through villages.

**Posters and folders.** The final CTTA media effort involved poster production and distribution. CTTA found that extension agents gave recommendations in terms of kilograms of fertilizer per hectare. But most farmers till only a fraction of a hectare and do not have a scale or a calculator with which to make the appropriate measurements and conversions. To solve this problem, CTTA developed a poster showing the correct dose of fertilizer in a tablespoon, so farmers could apply the right amount per planting hole and at the right time. Seven thousand posters with this message were produced and disseminated to all six SFCDP provinces. In addition, two other posters and a leaflet were produced for the FAO-managed National Integrated Pest Management Project in Yogyakarta, which also receives substantial funding from USAID. The first depicted soybean pests and their natural enemies. The second showed how to fertilize and harvest soybeans correctly. A folder was also produced that showed soybean pests on one side and their natural enemies on the other.

**Transferring CTTA lessons learned.** Two workshops were held to disseminate lessons learned through CTTA activities. The first was attended by participants from the six SFCDP provinces. The workshop focused on radio programming techniques, photonovels, and assessing visuals such as posters. Participants included staff from the Agricultural Service and Information Agencies who produce extension materials, and other agricultural extension professionals who are involved in producing and disseminating agricultural communications materials.

The second workshop showcased the CTTA pilot products and lessons for decision makers. Participants included the heads of the Agricultural Service Agencies from the six SFCDP Provinces, the Agricultural Information Agencies, and Bimas; high-level officers from the Extension Training Section of the Department of Agriculture; and others. The goal of the workshop was to show the CTTA results and products and to give the participants an opportunity to create ad hoc working groups in their provinces that might cut through the organizational and funding barriers that were obstacles to cooperation among the various departments of the Department of Agriculture.

**Impediments to carrying out CTTA.** Three obstacles were encountered in developing the CTTA pilot project in East Java. The first, which was to obtain permission to do the work, absorbed much time. To begin, it was necessary to get Department of Social Politics (Sospol) approval to do research for the developmental investigation phase and throughout the project to get formative evaluation of media. Permissions were also required from within the Department of Agriculture. For example, the Kanwil had to issue a letter permitting the Agriculture Service Agency to work with MARIF to produce the radio shows because research stations are expressly prohibited from having a role in extension.

Second was the difficulty of executing contracts with private contractors through the GOI. This was exacerbated by a split in responsibilities within the Directorate General of Food crops. Technical matters are handled by the Project Management Unit and financial disbursements were unified under a Pimbagpro who answers directly to the Director General. Thus, disbursements were not in the hands of the technical project managers.

Third, the most serious impediment, was inadequate funding from the Department of Agriculture to fully fund loan-supported activities. Because funds were not in the account of the Directorate of Food crop Production, Indonesian Project Management asked USAID to place the CTTA communications materials budget in the "direct reimbursement" category, which provided for reimbursement from USAID on receipt of proof of expenses paid.

**Other Activities.** In addition to testing and adapting the CTTA approach to Indonesian conditions, the CTTA Project was used as a mechanism to support other USAID Mission program activities in the agricultural sector, primarily the Secondary Food Crops Development (SFCDP) Project. Through CTTA, four long-term expatriate advisors (a chief-of-party, a senior economist, an econometrician, and an agronomist-communicator) and six short-term technical specialists worked with the SFCDP.

A variety of short-term technical studies were performed between 1988-1990, providing valuable additional information to the main thrusts of the project. A training needs assessment highlighted the need for improved English language capability over and above technical capabilities at all levels of the bureaucracy. Studies on credit and conservation farming systems pinpointed important factors essential to the success of future food crops development programs. A biological nitrogen fixation study and the follow-up training course in Thailand provided a timely foundation for the increased use of inoculant in the GOI legume crop program in 1990-91. Additional studies provided essential data for the CTTA pilot project and training activities.

In early 1988, when CTTA Project technical assistance began, the SFCDP-USAID Project, as the Secondary Food Crops Development Project was known in the Department of Agriculture, was emphasizing two sets of activities: promotion of higher-yielding agronomic practices through demonstration farms (demfarms) in the pilot provinces of East Java, Lampung, and South

Sulawesi and macro-economic analyses to help guide national food crop price polices. At that time, the plan was to continue these activities while adding CTTA-related components to improve communications methods in food-crop extension and improve food crops project management.

It soon became apparent that there was a missing link: addressing the micro-economics of food crop development in the context of integrated farming systems. This factor was seen as important for three reasons:

- Indonesia seemed to be moving into a stage in which agriculture would depend less on government programs and subsidies, and more on local initiatives;
- extension workers and progressive farmers would increasingly need to think in terms of economically viable whole-farm systems; and
- national policy makers would need to view policy proposals from the bottom-up and not just from the top-down as was the tendency in the past.

**Farm-level economics and food-crops systems.** The skills that seemed to be needed by Food Crops staff at both national and provincial levels related especially to farm management analysis, farm family socioeconomics, and systematic diagnosis of local needs for developing food crop systems.

The approach adopted was to build upon 1989-90 SFCDP-USAID activities and on-going DGFCA Food Crops programs, work with and through Indonesian staff, and emphasize improvements in skills and information that would have a lasting influence after SFCDP-USAID.

Three points of departure were used for farm-level socioeconomic activities:

- SFCDP-USAID baseline studies were proposed for the three new project provinces--West Sumatra, NTB, and NTT.
- A series of training courses for food crop development staff was sponsored by SFCDP-USAID in 1989-90.
- The BINUS Food Crops Farm Economics Subdirectorate decided that it was necessary to improve the cost-returns data base that was being used to guide national policy decisions.

The SFCDP/CTTA budget provided for several short-term consultancies. Two of these were fashioned to reinforce local food crops systems development: a review of options for improving access of small farmers to credit for food crop development and an exercise to stimulate attention to soil conservation aspects of food crop systems.

**Baseline studies.** Early in SFCDP, baseline studies had been conducted through university contracts in East Java, Lampung, and South Sulawesi. Their intent was to establish benchmarks against which to compare progress stimulated by the demfarms and other local SFCDP-USAID funded activities. A follow-up survey was completed in South Sulawesi in 1988. The exercise provided descriptive facts about samples of farmers.

When SFCDP/CTTA began in 1988, there were plans to conduct similar baseline surveys in West Sumatra, NTB, and NTT during the second half of 1988 or the first half of 1989. But the new SFCDP/USAID director, correctly wanted the studies to provide a sound basis for formulating food-crop development strategies. He did not want them to be only instruments for impact evaluation. He also wanted to involve provincial officials, research and extension specialists, and university faculty so that they would learn from the exercise and become accustomed to working together on food crop matters.

Overall, the baseline studies still focused on farmer surveys and descriptive information. However, SFCDP/CTTA technical assistance did help sharpen thinking about study objectives and information needs and stimulate analysis that related more closely to food crop development programs. At the same time, Food Crops staff were exposed to rapid-reconnaissance methods that could be used to diagnose local problems and potentials.

**Training courses and workshops.** Good use was made of SFCDP/CTTA team members in designing and conducting various short courses and workshops held in 1989 as cap-offs to SFCDP. The 1989 training helped launch farm-level economics as an integral part of food crop development activities. Several participants expressed interest in further developing their economics and farming-systems analysis skills. Although there was not time in this program, it is hoped that food crops officials and donor agencies will include farm management analysis and extension education in future projects and programs.

**Improving the food crops farm management data base.** The Food Crops Farm Economics Subdirectorate (BINUS/Usahatani) had for several years been collecting per-hectare cost-and-returns data for rice and palawija crops. But, its small budget prevented staff from going to the field. Data were consequently obtained through instructions to local extension workers without supervision from Jakarta. Unfortunately, the group had no computers, data tabulation was slow, and there was no capacity to do spread-sheet, production-function, or linear programming analyses. Also, sampling and data quality were questionable, and the Jakarta staff had little firsthand knowledge of farming conditions in the source areas upon which to base their data interpretations and policy advice. There was a need to obtain more information about farmers' resource constraints and institutional settings.

The chief of BINUS/Usahatani worked with the CTTA senior economist to prepare the 1989 SFCDP-BINUS farm management training courses. This led to some fresh ideas about how the farm management data-gathering for use at national levels might usefully be combined with

extension activities on record-keeping and farm budget analysis for farm families. By March, they had developed a proposal for trying this on a pilot basis in the SFCDP provinces under additional special activity grant funds from USAID.

Jakarta staff members were to be involved in the pilot field work to give them firsthand understanding of current farming situations and to develop case examples for a cross-section of situations for farm budgeting and linear programming analysis. The proposal also called for computerizing data tabulations in Jakarta and demonstrating how farm management analysis could be used to help plan food crop programs and policies. The proposal was favorably received, but the pilot extension component was eliminated, and fewer localities were included in the sample.

Meanwhile, with low-key reinforcement by the CTTA senior economist, BINUS worked hard to plan the survey, questionnaire, and data analysis. The Farm Economics Subdirectorate teamed with the Food Crop Resources Subdirectorate (which deals with credit needs and resources) to involve 12 junior and 3 senior staff members.

In October 1989, the BINUS Farm Management Group received access to two computers. By late 1989, the regular data base and annual tabulations were being computerized, several staff were gaining proficiency in programming, and the computers were proving valuable in meeting special information requests from high officials.

The SFCDP/CTTA sponsored survey was conducted in January-February 1990. Information was obtained from 360 farmers in 24 local extension areas (WKBP), each comprising two to five villages, within the six SFCDP provinces.

However, this farm-management thrust and technical assistance ended before there was an opportunity to demonstrate the usefulness of farm management analysis for policy making, or ways in which farm management education for farmers might be handled. These activities might also have helped achieve better integration of the Food Crops farm management work with other Food Crops efforts in agronomy, extension, outlook information, horticulture, and program planning.

The work, however, did have important catalytic effects. BINUS staff learned much about farmers' situations through participating in the field survey. The new data will not be quickly outdated and will enable them to make more realistic assumptions when doing analyses related to farmers' potentials and likely responses to policy changes. It appears that the BINUS farm economics budget may increase significantly in coming years. This would enable the subdirectorate chief to make improvements that incorporate the ideas that were discussed and tried under SFCDP/CTTA.

Perhaps the most important impact of the supplementary funding that supported this technical assistance was the spirit of fresh endeavor and teamwork that was created in the two BINUS

units. Planning and conducting this special activity together, and also acquiring computers, breathed new life into the units.

**Econometrics support.** In 1986-1987, BINUS, the Directorate for Food crops Economics in the Ministry of Agriculture, obtained assistance from the SFCDP Project and during the following three years conducted two intensive studies -- a supply and demand study, and a price and quality study. Before completing the second study, assistance of the SFCDP Project was extended. One of the SFCDP consultants obtained a permanent office in the market information subdirectorate and, according to a project amendment released by USAID/Jakarta, more SFCDP activities and money were allocated to BINUS.

In 1989, the MOA decided to use funds from several USAID-financed projects to support economic research activities conducted in cooperation with Iowa State University's CARD Project. Some of this money was allocated to research activities coordinated by BINUS. It is important to note that during the last two years the focus of activities was shifted from the Market Information Subdirectorate to almost all other BINUS subdirectorates. This was the result of the CTTA consultant team's active role in identifying specific and useful activities for BINUS as a whole and BINUS' responsiveness to the consultants' efforts.

The econometrician's first task, in March 1988, was to complete the price and quality study. The study consisted of two parts, the first on rice and the second on secondary food crops.

The consultant's second task was to design, conduct, and monitor an economic training program to transfer the results the studies to staff of the MOA and related government agencies. In this context, BINUS conducted 14 training sessions at the central level and in six provinces. From May to September 1988, the consultant prepared these training courses, which were documented in several books and materials published by BINUS. He also conducted econometric training in BINUS for staff from different MOA agencies. For this, training materials were directly taken from the supply and demand study data bank.

A third task was to rehabilitate and improve the existing market information system. For this, the project hired a management system specialist with significant experience in development projects in Indonesia. As a result of this work, BINUS began publishing, in January 1990, a Quarterly Market Outlook Report.

The fourth main task was to update and simplify the existing BINUS supply and demand model. This was an ongoing activity documented by working papers and publications. One such paper, showing the simplified model structure, was published in London University's journal, *Applied Economics*, in 1990. A draft of the updated BINUS supply and demand model was completed by the end of the project, and BINUS counterparts were using the model for policy analysis and to conduct updates. Links between BINUS and Gadjahmada University in Yogyakarta, which were forged as a result of policy makers' increasing interest the model, will help sustain this activity.

**Agronomic/communications support.** A CTTA agronomist-communicator served in Indonesia from February 1989 to April 1990. He was attached to the PMU under the Director General for Food Crops in Jakarta. Major responsibilities of the post included providing support to demonstration farms, extension worker and farmer training, assisting the communication pilot project, supporting baseline studies, and managing cropping trials.

Demonstration farms. Baseline studies were conducted in each province before demfarms were initiated. Cropping patterns, fertilizer and pesticide rates, and other technologies were studied at experimental sites in each province the year before the demfarms began. Extension agents whose jurisdiction included demfarms received special training from the district office to enable them to better serve the farmers' groups.

Farmers said they joined a farmers' group to receive credit or benefits from the revolving fund. Although credit was generally available through local money lenders, interest rates were roughly 60 percent per year. Credit through farmers' groups was less expensive. The groups could collectively make major purchases of machinery (such as hand tractors) at lower cost than were available for individual purchases.

Many farmers said that access to improved cropping patterns attracted them to the demfarms. Most of the new cropping patterns were a mix of intercropped cassava, maize, and legumes. Cassava was popular with poorer farmers because it was seen as insurance against hunger if other crops failed. Intercropping was also popular because it reduces risk. Wealthier farmers preferred monocropping. Farmers who worked seasonally also preferred monocropping with cassava because of the low labor requirement. Cropping patterns were flexible so that if a group wanted to try a different pattern it could design its own pattern with the help of an extension agent.

New crop varieties met with mixed acceptance. Poor taste was a negative factor of several hybrid maize varieties that were introduced. Nonetheless, farmers were still somewhat enthusiastic because hybrid maize gave yielded surpluses that could be sold. Improved, open-pollinated maize varieties were fairly popular. Their taste, yield, and storage properties seemed intermediate between those of hybrid and local varieties.

The most successful of the introduced crops were open-pollinated, early maturing mungbean and soybean varieties. The seed often had different properties from local seed (color, size) but markets for it developed quickly. Farmers appreciated early-maturing varieties because of the flexibility they provided, even if they yielded proportionally less. Often, seven to ten days make the difference between success or failure of crops planted at the end of the rainy season.

Simple, non-motorized machinery was not well received by farmers. Hand-operated machines such as maize shellers, peanut and soybean threshers, and cassava slicers were usually rejected because they saved only a little time and were considered odd by farmers. Women sometimes rejected machinery because the noise interfered with their conversation with other women or

because only one person was required. Women enjoyed postharvest operations as social events. Men were interested in motorized equipment.

Extension agents. Demfarm success often depended on the quality and activity of the local extension agents (PPLs). Service to demfarms were often limited by lack of transportation or expense money, distance and poor road conditions, and lack of time because of other duties. Some demfarms rarely received PPL visits. Some PPLs did not know where the demfarms were in their district.

Local extension agents saw their primary duty as teaching the farmers. They rarely visited farmers' fields. As a result, many PPls lacked practical experience. For example, many farmers' groups did not follow the package of recommendations for fertilizers and pesticides. Often, fertilizers were not applied, applied at the wrong time, or improperly placed. These mistakes might have been overcome by closer extension agent supervision.

Demfarm impediments. Late arrival of packaged inputs, seed, pesticides, etc., severely hindered demfarm success. Most delays were caused by government bureaucratic procedures. Farmers who experienced late package arrival sometimes planted several weeks late. This almost assured that one crop would be poor or fail.

Reliable supplies of hybrid seeds were difficult to obtain. Because villages in remote areas had no distributors of hybrid seed, they often returned to traditional varieties after one year. Later in the project, demfarms were enlarged from 5 to 25 hectares with the hope that farmers would be better able to buy and market seed. Many demfarm inputs were not available to neighboring farmers. Why should a farmer be interested in a demfarm if he could not obtain similar inputs?

Demonstration farms with secondary food crops were not nearly as easy to develop and manage as those with rice. Up to 30 crops comprise secondary food crops. The task of spreading rice technology is simpler than it is for secondary crops, for which cropping patterns, use, processing, and markets are more complex and vary widely among districts.

Technology spread. Technology spread generally was measured by growth of farmers' groups or number of new participants. This number averaged about 60 percent per year but was deceptive. New participants joined more for available credit than to learn about new technologies or practices. Farmers' groups also may have been encouraged to enroll more members through pressure from local officials.

Many technologies were not uniformly practiced by demonstration farmers. Technologies such as planting soybean in rows versus broadcasting were often practiced by some farmers within a group and ignored by others. Those who did not practice the new technologies were either too

busy to spend the time to plant in rows, weren't convinced of the possible increased returns, or were not well monitored by either the head of the group or the extension agent.

To be a good illustration for other farmers, demonstration farms must be very successful. Many SFCDP demfarms were not sufficiently successful to attract the attention of neighboring farmers; some were failures.

Crop trials. Technical assistance was provided to provincial SFCDP advisors and their counterparts to conduct studies and activities that contributed to identifying and assessing technologies that could be disseminated to farmers through mass media and conventional (including private) extension channels.

It was intended that agricultural research in each province would identify new cropping patterns and technologies that would be disseminated to farmers through the demfarms. Regional research stations such as MARIF and MAROS, the provincial agricultural extension service, and one university conducted the experiments. Regional research stations were the preferred institutions, but were not located in all provinces and did not have the resources to conduct experiments on relatively short notice.

MARIF, in East Java, and MAROS, in NTT, did the best jobs of selecting improved cropping patterns and conducting appropriate experiments in which farmers had important input. MAROS, in SulSel, also developed some good cropping patterns. Experimental results from other institutions were not as good because the organizations did not have adequate expertise and experience. Some demfarms were started without experimental results because the trials were poor. Also, funds for trials often arrived late, causing a job to be rushed and results to be available. Of the six provinces, only MARIF (East Java), MAROS (NTT), and MAROS (SulSel) conducted effective cropping pattern trials that were later implemented in demfarms. These trials resulted in improved cropping patterns in East Java and NTT.

Training. Training was a CTTA/SFCDP success story. CTTA staff were able to work closely with their Indonesian counterparts, and timely arrival of funds was not so great a constraint as it was in other facets of the project.

Training topics were chosen based on needs determined by provincial extension offices and a CTTA short-term training needs assessment. Other activities were planned by CTTA and implemented by counterparts, with occasional assistance from CTTA staff. As part of training, staff distributed tapes of mini-dramas and other communications materials to participants. The rapport developed with the participants was invaluable. Staff met many of the trainees during field visits and were able to build on those relationships and therefore work more efficiently in the provinces.

Much of the training effort was devoted to developing a two-week short-course called *Palawija Terpadu*, Integrated Secondary Food Crops. Promising, mid-level Department of Agriculture personnel from central, provincial, and area offices were chosen as participants. It was felt that a broad exposure to agricultural economics, agronomy, communications, and management would widen the perspective of participants and help them think in terms of farming systems rather than individual units. In addition, farmer risk was a central theme to the course. The course examined why farmers choose methods of farming which are relatively unprofitable and how some government programs unwittingly increased farmer risk.

*Palawija Terpadu* was held three times: in West Java, where most participants were from the central Department of Agricultural offices in Jakarta; in Lampung, for workers from Lampung and West Sumatra; and in East Java, for participants from Sulawesi Selatan, East Java, NTB, and NTT. Ninety-five Department of Agriculture personnel attended the course.

Training also included a train-the-trainers component. Most courses were co-taught by CTTA staff and local counterparts. CTTA staff focused on helping their counterparts to teach the course by supplying technical information and by showing the teachers how disciplines interrelate. For example, the soil conservation course included attention to economics and explored why some conservation programs are not economically viable. A field trip was arranged to give the participants a chance to do a rapid reconnaissance survey and to design their own program to help area farmers. The following day, panel discussions were held in which participants and teachers played roles and questioned each team's field assessment and planned agricultural improvement programs.

Participants were also familiarized with two computer simulation programs, one on soil conservation and the other on linear programming. The soil conservation program developed into a competition between teams of participants to determine who could be the farmers with the most profitable farming system and the least soil loss. These exercises were very useful, especially considering that many of the participants from the kabupaten level had never before used a computer.

Communication pilot project. The agronomist-communicator worked with the senior communication specialist on the design, initiation, and evaluation of the Malang pilot site. In addition, he participated in selecting and drafting agricultural technology messages for dissemination through the selected communication channels and in the pretesting of those messages and materials.

The two CTTA advisors developed a training and dissemination plan for institutionalizing the CTTA communications model within the MOA, conducted a workshop for kabupaten and provincial level officials, visited selected provincial and kabupaten sites to assess local situations and prospective trainees, and conducted follow-up visits to selected provinces after the workshop to monitor and support the implementation of the CTTA model.

The communication pilot project represented another CTTA success in Indonesia. The pilot program put farmer needs as its first priority and provided agricultural extension staff with a useful example of a farmer-sensitive extension approach. Although there was not enough time to evaluate impact, farmers did actually receive appropriate extension materials, which rarely occurs under the traditional system. Photonovels received much praise from both farmers and agricultural extension agents.

In addition, a slide set on soil conservation was developed through close cooperation with the extension directorate. This cooperation and participation of several extension personnel in the

communication courses brought about many positive results in terms of adopting farmer-sensitive communication methods.

It was originally envisaged that the agronomist-communicator would coordinate a provincial version of the pilot project. This did not develop. Instead, the agronomist-communicator was posted in Jakarta, with short-term communication activities in both Lampung and Sulawesi Selatan.

Baseline studies. The agronomist-communicator visited NTT and NTB several times to assist with the planned baseline agricultural studies, and CTTA staff attended seminars in all three new provinces. Delays in contracting with provincial universities and late arrival of money caused these studies to be done after demfarms were initiated rather than before. It is difficult to predict the outcome of the final reports. NTT and Sumatra Barat rushed their seminars because of time constraints imposed by the project closing date and presented materials before they were ready. NTB performed especially good work in collecting and analyzing data. CTTA was able to influence how the analyses was done in NTT and NTB, making these studies more useful.

**Jordan**

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|---|---|
| Project Start-up Date: | October, 1988 |
| Activities Completed: | November 1, 1989 |
| Primary Host Country Institution: | National Center for Agricultural Research and Technology Transfer (NCARTT) of the Jordanian Agricultural Development Project (JNADP) |

CTTA worked in two distinct agroecological regions in Jordan. Primary project activities consisted of identifying pesticide and wheat technology packages and designing associated communication interventions.

**Jordan Valley.** During the first months of project implementation in the Jordan Valley, the long-term advisor and counterparts held several meetings with the director of the Deir Alla Agricultural Directorate, research staff, extension agents, farmers, and laborers to learn about problems and issues upon which a communication program might focus. These developmental investigation exercises, and information collected from previous studies, showed that pesticide misuse and poisoning was widespread, particularly after the introduction of plastic greenhouses in the early 1970s. Discussions with plant protection specialists, medical doctors, University of Jordan Community Medicine researchers, and representatives of other Jordanian ministries further substantiated the need to encourage safer use of agricultural chemicals, particularly pesticides.

Although other agricultural information needs might have been addressed by CTTA, the problems associated with the misuse and health hazards of agricultural chemicals in the Jordan Valley seemed ideal for beginning to build a communication program. Information about pesticide use and safety could be made relevant to all crops and all locations in the Jordan Valley, and other Jordanian institutions had expressed interest in working to promote pesticide safety, and therefore were willing to cooperate and to collaborate in producing and disseminating pesticide-related information. Also, a video program, produced with USAID funds, existed which addressed many of the problems and solutions in pesticide application, and could provide an excellent tool for testing, information dissemination, and training extension agents in using communication media.

**Jordan Highlands.** The availability of an improved package of wheat technologies appropriate for farmers in the Jordan Highlands seemed a good starting point for CTTA communication interventions there. Transfer of the package, which consisted of several components including land preparation, seeding, weed control, harvesting, and post-harvest handling, to farmers seemed an appropriate starting point which might be addressed through a combined media and extension agent program.

Also, new cultivation equipment recently had been imported to Jordan which could be used in video-taping equipment demonstrations that might be used by extension agents during on-farm demonstrations. There also was wide support among USAID, CID/WSU, and NCARTT for developing a communication and extension effort to help encourage wide-reaching improved cereals production. Further, USAID and NCARTT were conducting a national survey of wheat growers which would allow CTTA to play a part in identifying potential target audiences to help guide in developing a communications strategy and to help NCARTT reach the right target groups during cereals demonstrations on MOA farms.

**Training.** Throughout the long-term advisor's tour, the NCARTT Information Unit Director and staff, NCARTT Extension staff, Deir Alla counterparts, and appropriate NCARTT and CID/WSU staff received daily reports and assistance in applying the CTTA communication methodology to technology transfer tasks related to pesticide use and wheat technologies.

In February 1988, CTTA participated in a month-long course in plant protection given by NCARTT and CID/WSU, during which the long-term advisor and information unit counterpart conducted a two-day seminar on communication strategies. During this hands-on training, CTTA used video interviews of farmers in the field as a simulation game for participants to respond to in identifying possible communication strategies with which to address a variety of technology transfer needs. During the course, CTTA also helped extension agents interpret results of field surveys on plant protection and pesticide use that were gathered as part of workshop activities.

From April to July 1988, CTTA trained Jordan Valley extension agents in communication techniques by focusing on the use of the *Safe Use of Pesticides* video produced by Friedrich Naumann Foundation. In April, two days of seminars focussed on identifying pesticide misuse during observation visits to farms and through informal survey techniques. Through these exercises, CTTA obtained extension agent participation to establish a feedback mechanism to assess communication interventions after the pesticide program was initiated. Extension worker training in the Jordan Valley also included 20 on-farm visits to show and discuss the pesticide video with laborers and farm owners. During the video display visits, each extension agent learned how to conduct developmental investigation interviews with farmers, how to use the video equipment and interact farmers after they viewed the video, and how to conduct follow-up focus group sessions to document farmer reactions to the recommendations included in the video.

**Information testing and dissemination.** The training activities described above were done, in part, to test the effectiveness of certain messages and presentation media on target populations. The results of the tests were used to develop a communication strategy to promote safe pesticide use. During the first six months of CTTA activity, Radio/TV Jordan were beginning to produce and disseminate radio programs and spots on pesticide use and safety. However, these broadcasts were not coordinated with extension activity in the Jordan Valley. CTTA developed and promoted that coordination, and with counterpart assistance, enlisted cooperation of Radio/TV Jordan to time all subsequent radio and TV broadcasts as closely as possible to the agricultural season and ongoing practices in the Jordan Valley.

**Developing a strategy to promote methyl bromide safety.** Following extension agent training and media testing of target populations in the Jordan Valley, CTTA and counterparts were able to gain access to local medical records. A review of the records showed that one of the most dangerous agrochemicals being used was methyl bromide gas, a soil fumigant used in plastic greenhouses. Significant numbers of poisoning cases had been reported. With this information, developing a campaign to promote safe use of methyl bromide was identified as a priority for the next growing season. CTTA built upon counterpart and extension worker training and relationships developed with Radio/TV Jordan to design a methyl bromide safety campaign.

Continual access to Jordan Valley medical records would show changes in the incidence of pesticide poisoning that might be attributed to information disseminated through the

communication interventions. Such access, combined with periodic informal surveys in the Jordan Valley would form the basis of a feedback system for ongoing communication assessment.

In July 1988, CTTA counterparts worked with the long-term advisor to develop a methyl bromide safety campaign strategy which included detailed messages and a multi-media production and dissemination plan to use broadcast and local press, posters, a private magazine, and Jordan Valley agricultural extension agents from MOA and JVFA. The strategy included a feedback and evaluation system that would assure the messages would be received by targeted populations.

During spring and summer, Radio Jordan broadcast public service messages and narratives about methyl bromide safety on the daily, 6:30 a.m., agricultural radio program. Counterparts and the long-term advisor coordinated production of a 20-minute video, five public service television spots, a poster, and magazine article with the Ministry of Information's Development Communications Office. Information Unit and Deir All counterparts worked through Jordan Valley extension agents and JVFA to disseminate the new pesticide safety video and posters in the Valley. By the end of the long-term advisor's assignment, the strategy and campaign were in full operation.

**Formative and summative evaluation.** During September 1988, Applied Communication Technology, CTTA subcontractor, conducted a field-level qualitative study to estimate the impact of CTTA Jordan activities. Results of interviews with officials of MOA, NCARTT, CTTA counterparts, Deir Alla research staff, Pesticide Residual Lab staff, USAID/Amman, CID/WSU, University of Jordan, the media, farmers, and laborers revealed that CTTA's program in pesticide safety was having positive, and expanding impact.

**Supporting technology transfer for wheat production.** CTTA activities to develop a communication strategy to disseminate information about the recommended wheat technology package began somewhat later than activities in the Jordan Valley. The wheat strategy was similar to that used in the Jordan Valley, but began with more specific content information and included more audience analysis.

In summer, 1988, the NCARTT Cereals Unit, working with Information Unit CTTA counterparts, conducted two video focus groups with farmer groups at Madaba, a large wheat producing area near Amman. Findings from the focus groups indicated that video was a viable medium for generating discussion about wheat technology issues and problems, and would be an excellent tool for showing equipment operators the importance of the new technology and how to operate and maintain the equipment used to implement the technologies.

NCARTT and CID/WSU staff agreed to set up an extension training program for the 1989-1990 wheat season to train extension agents how to promote and explain the new wheat technologies to farmers. The program would use videos, supplemented with brochures, other print materials, broadcast messages, and other mass media messages.

A collaborative arrangement was made between NCARTT, JCO, and Friedrich Naumann Foundation to produce five video programs describing the wheat technology package. The first step was to shoot field footage of cultivation during the 1988-89 wheat season. NCARTT's Cereals Unit, working through CID/WSU, began to provide information for scripting the videos. The videos were to be filmed by Friedrich Naumann Foundation staff. Production of the first two programs had begun by project end, with filming of the three remaining programs expected during the 1988-89 wheat season.

**Short-Term and Other Assignments**

CTTA completed a variety of technical assistance missions in the countries where the pilot projects were based and in other countries around the world. Summaries of the special technical assistance missions and project design and evaluation activities performed are presented in the following section.

**Honduras Agricultural Research Foundation (FHIA).** The Honduran Agricultural Research Foundation (FHIA), a private, autonomous research organization, in La Lima, Honduras, was founded when United Brands Company closed its Tropical Research Center for banana and plantain. United Brands donated the research facilities to the new Foundation with the condition that funds be found to support its activities. FHIA's founding mandate was to help Honduran farmers increase their agricultural efficiency and output. In addition to research-based activities, two support units were to be created, a communication unit that would enhance dissemination of information about agricultural technologies from the research station to its multiple audiences and a development/fundraising unit to promote FHIA activities and attract funding.

CTTA received funding in 1985 through USAID/Tegucigalpa to help FHIA build these capacities. When the project started, virtually no communication or development staff, facilities, or equipment existed. By project end, a communication and training center had been renovated and equipped that consisted of administrative offices, a library, a public relations unit, a radio/television studio, audiovisual storage, a printshop, a graphic arts unit, a photography unit, and writing and editing facilities.

Cornell University, a CTTA subcontractor, hired a senior agricultural communication advisor and a development advisor to work with FHIA to staff and develop the units. Throughout the three-year contract, Cornell also identified advisors who assisted with needs assessments and development of communication strategies and plans, facilities design, equipment purchases including complete computer systems, and desktop publishing and information dissemination software. CTTA advisors also trained FHIA staff in skills such as printshop procedures, library documentation and organization, and graphic techniques for publications. A series of in-house seminars was designed and are continuing to stimulate exchange among FHIA scientists. Furthermore, these seminars laid the groundwork for scientists' participation in professional networking and exchange activities. Also, publications such as technical bulletins and general

FHIA promotional materials, and graphic and audiovisual materials are routinely prepared and produced in-house.

As the communications and training components were being introduced there was an equally strong initiative to establish a development division to organize public relations and fundraising activities. It was crucial that FHIA's activities be documented and presented in a format that would quickly attract donors and therefore assure funding for high-quality research and dissemination. During CTTA, FHIA produced a *Development Prospectus* suitable for presentation to ambassadors and other potential donors, a series of English and Spanish promotional brochures, and the first FHIA Annual Report, in Spanish and English.

In addition, an important public relations coup was realized when articles about FHIA appeared in *Discover* and *Time* magazines. These and other public relations and development efforts during CTTA substantially enhanced FHIA visibility and helped demonstrate FHIA's potential contribution to improve Honduran agriculture. When summing up CTTA support of FHIA development and communication activities, Blair Cooper, USAID/Tegucigalpa, said, "The CTTA activity with FHIA has succeeded in establishing a dynamic Communication Department."

**West Africa.** An agricultural technology identification and assessment field study was conducted in Senegal and Niger in November 1987 by a CTTA consultant team. The purpose was to identify new and underutilized agricultural technologies appropriate for farmers in selected African countries that are available from national, international, and regional research institutions. Objectives were to:

- identify and categorize technologies in each country that were ready or almost ready for diffusion to farmers, or that were promising for the future; and

- make recommendations for improving diffusion to farmers of ready and almost ready technologies.

In evaluating the technologies identified, the team assigned a ready classification if it appeared that the technology could be adopted immediately and beneficially by farmers. An almost ready category was assigned where it appeared that some adaptive research was needed and/or moderate institutional or other constraints would have to be alleviated before the technology could be recommended without reservation to farmers. Promising technologies were those that appeared to need substantive research and/or institutional modification before farmers could adopt and use them beneficially. In developing recommendations for improving diffusion to farmers, the team focused on working through existing institutions.

Agricultural, institutional, and socioeconomic constraints were considered to be critical in determining the stage of readiness of a technology for diffusion. The range of factors involved, and the objective of developing recommendations for improving diffusion, made a multi-

disciplinary field study team essential. Therefore, the team was comprised of an agricultural technologist, an extension and communication specialist, and a rural sociologist.

The investigation in each country focused on rainfed cereal crop production. Technologies identified and assessed in Senegal were grouped into five technology sets plus five areas of technology-related observation. Eight sets were identified and assessed in Niger. The technologies and assessments of each as to stage of readiness for diffusion to farmers may be summarized as follows:

| Senegal | Niger |
|---|---|
| 1. *Using improved seed | 1. Phosphate fertilization |
| 2. *Increasing soil fertility | 2. *Improved multiple cropping |
| 3. *Improving soil management and tillage | 3. Using animal traction |
| 4. *Optimizing seed placement and row spacing | 4. Implement tillage |
| 5. *Improving pest control | 5. **Forage production |
| 6a. *Improving timeliness of operations | 6. Weather-responsive crop management |
| 6b. Response farming | 7. ***Striga* control |
| 6c. *Introducing new crops | 8. *Water harvesting |
| 6d. Alley cropping | |
| 6e. *Exploiting the rotation effect | |

* Technology (or component thereof) assessed as ready.
** Technology (or component thereof) assessed as almost ready.

A commonality of the selected technologies was that they do not, for the most part, represent technological advances per se. Rather, they consist primarily of adjustments in fundamental aspects of field management or improvements in basic, often already existing, farming practices. Advanced technologies, such as applying commercially mixed fertilizers or using mechanized equipment, will remain inappropriate for most of Senegal and Niger until the more basic elements of management, such as reducing soil erosion and using quality seed, are implemented.

The CTTA study team found that the limited information farmers receive about their basic management practices is seldom adapted to their circumstances. For example, crop management recommendations were uniform for the entire country. To overcome such problems, farmer-research-extension linkages and the agricultural extension system must be strengthened. The strengthening process should include:

- identifying problems that limit production in each extension agent's local area;
- establishing an effective two-way farmer-research-extension communication system;
- assembling information pertaining to the problem's solution and/or outlining research needed to provide the information;
- establishing locally-customized on-farm trials designed to demonstrate management needed to overcome the problem;
- training agents as communicators and educators; and
- integrating the use of mass media and other channels into the conventional extension dissemination methodology.

As indicated throughout the report, more research--particularly to localize recommendations--is be needed, and there is urgent need to strengthen and modernize extension services to farmers. Even if both are accomplished, however, significant (in some cases, absolute) constraints to widespread, farmer adoption of improved agricultural technologies will likely remain unless some parallel action is initiated to alleviate them. These constraints include institutional factors such as lack of credit, inadequate delivery systems, insufficient support industries, undeveloped markets, etc. and socioeconomic factors such as input costs, social and cultural obligations, price policies, and so on.

Niger. As an outgrowth of the technology identification activity, CTTA conducted a more in-depth study of farmer innovations and communication in Niger in 1988. CTTA researchers observed and described farmer-to-farmer communication networks in relation to the transfer of farmer innovations. Emphasis was placed upon farmer-to-farmer information flow, with related opportunities for involving research and extension in farmer networks.

Field research was conducted in seven villages with and without cooperatives, expatriate projects, and resident extension agents; located on and off roads; and located near to and far from urban areas. One team member visited all the villages. The other conducted in-depth research in one village. The team interviewed several hundred Nigerien men and women. Twenty case studies were compiled. In each, at least part of the communicative route an innovation took in reaching the study site could be traced. The case studies became thumb-nail histories of introduction and adoption of specific agricultural technologies.

In studying agricultural innovation in Niger, the CTTA team refined concepts of innovation and diffusion and identified three types of innovations, those made by or adopted from Sahelian farmers, those introduced from other sources, and those which represent a mixture of processes. The team found that Nigerien farmers are open to, seek out, and apply new agricultural ideas; plan, implement, and evaluate on-farm research trails; and demonstrate a sophisticated understanding of the complex interactions among the many variables they manage. The case studies also show that there is a rich body of local technical knowledge in agriculture that could be useful to farmers throughout the Sahel.

The scope of work asked "What characterizes the technologies that farmers have adopted?" Researchers found that farmers chose technologies because they reduce risk, generate income, are affordable, are readily available, save labor, and fit into farming practices. Observation of and interviews with farmers suggested that rich communication networks exist and are linked by individuals and groups. The CTTA team also identified other communication channels which are used for agricultural information or have potential for use.

Although the study did not directly address research-extension linkages in Niger, documents and interviews with USAID personnel and others indicate that connections between the two were quite weak. The limited information collected by the team during in-depth and survey research suggested several conclusions, including:

- very few technologies offered by research and extension were deemed appropriate by farmers, and

- farmers reinvent technologies coming from formal research, but there appeared to be poor feedback loops to research and extension that show how farmers are thinking about and changing these technologies.

Based upon its findings, the team recommended that efforts be made to:

- strengthen farmer-to-farmer communication of indigenous agricultural knowledge;

- strengthen farmer feedback loops to research and extension;

- allow farmers to participate in trials of new technologies;

- offer farmers greater opportunities and incentives to more systematically experiment for themselves;

- use interactive radio and television and other mass media, with priority topics determined by farmers, to disseminate findings and practices; and

- mobilize women's and young people's associations to participate in on-farm experiments, and cultivate cooperatives as major conduits of agricultural information.

A final report of this study, in both English and French, was submitted by A.I.D./ Washington to USAID/Niger, which incorporated some of the report's recommendations into new Mission programs. More than 220 summary reports, 250 full-length reports, and 135 French translations were distributed to an expanding network of individuals and organizations interested in documenting and applying information from indigenous knowledge systems to achieving development goals. The applicability and timeliness of the report sparked interest and requests ranging from students and university professors, to development publications, to the development community and policy makers. Backgrounds of people who have requested the report include anthropology, agriculture, forestry, rural development, communication, and education.

Based upon the interest generated by the Niger study, AED sponsored a workshop on *Indigenous Knowledge Systems: Implications for Agriculture and International Development.* The workshop brought together a small group of experts from around the world to discuss such topics as:

- identification and documentation of indigenous agricultural technologies,
- use and diffusion of indigenous agricultural technologies, and
- integration of indigenous agricultural technologies in agricultural development.

**Nicaragua.** At the request of USAID/Managua, CTTA fielded a two-person team to assess the potential for implementing a low-cost technology transfer program to revitalize Nicaraguan agriculture after a decade of economic decline and civil war. The objective of introducing such a technology transfer program was to help Nicaragua regain its position among Central American countries in the production of select crops for export and domestic consumption.

The team identified several productivity-enhancing technologies that could be extended to and eventually adopted by a cross section of small-, medium-, and large-scale agricultural and livestock producers throughout the country. Their findings were based on interviews with representatives of public and private sector organizations at the national and regional level; small, medium, and large farmers and ranchers; a review of documents; and two field trips to the nation's interior. Recommendations, based on the successes of the CTTA Project in other Latin American countries, were made on how the CTTA methodology might be adapted to match the conditions and barriers that confront Nicaraguan agriculturalists.

The team subsequently prepared and submitted a proposal entitled *A Low-cost Communication and Technology Transfer Program to Revitalize Nicaraguan Agriculture* to USAID/Managua. The proposed program would support and complement the Mission's Private Agricultural Services (PAS) Project.

As an follow-up of this mission, CTTA staff returned to Nicaragua to conduct a five-day workshop in Esteli. The workshop sought to explore with representatives of the Ministry of

Agriculture and Livestock (MAG) and other officials whether the CTTA process could contribute to MAG's efforts of trying to increase national agricultural production and productivity.

Twenty-six participants--primarily regional directors of extension, directors of agricultural research centers, agricultural communications specialists, and crop specialists from the National Agricultural Commissions--attended the workshop. Among topics covered were "How to Conduct a Developmental Investigation," "Technology Validation and Adjustment," "Designing Communication and Technology Transfer Strategies," and "Monitoring and Evaluating Technology Transfer Activities." Daily sessions included presentations of CTTA's experiences in other countries, plenary discussions, and small working groups.

Participants also reviewed the strategy originally proposed by CTTA for introducing a low-cost communication and technology transfer program (submitted to USAID/Nicaragua, January 1992).

The workshop's usefulness was evaluated by MAG staff. Results were overwhelmingly positive. Ninety percent of the respondents said the workshop was helpful and relevant to their work. Several respondents indicated that the CTTA process should be adopted by MAG; moreover, most participants asked for additional training in the CTTA technology transfer process. For many participants, the coming together of researchers, communicators, and extensionists was the highlight of the week-long workshop, as it allowed them to share professional experiences, forge new relationships, and explore how they might work as a team to address various technology transfer issues.

The collective view of the CTTA team was that virtually all workshop participants recognized the versatility, flexibility, and appropriateness of the CTTA methodology. MAG representatives could benefit tremendously from additional training in the CTTA methodology. As of October 1992, MAG officials were requesting financial support from USAID/Managua to support eight CTTA training workshops for 220 extensionists, researchers, communication specialists, and technical staff.

**Bolivia.** In 1990, CTTA conducted a case study analysis of private agricultural producer organizations that had been assisted by USAID/Bolivia's Private Agricultural Producer Organizations (PAO) Project. The evaluation team reviewed the PAO Project's accomplishments in view of the changing political and macro-economic conditions in Bolivia during the previous five years. The evaluation report was based on field visits to eight PAOs, a review of relevant project documentation, and interviews with project personnel in USAID/Bolivia, the consulting firm implementing the project, and PAO officials and farmer members. Results of the evaluation were to be used to guide the design of a two-year project extension. Among the evaluation team's recommendations were the following.

- Technology transfer must be given priority. It is key to PAO programs because increases and improvements in production, especially for export, require an effective technical extension system, which is allied with input supply and production credit.

- Greater emphasis should be placed on environmental concerns related to the PAO Project, as was elucidated in the project design. Technology transfer systems must explicitly incorporate environmental considerations. Extensionists must insist equally on appropriate and safe practices. In the rose industry, for example, extensionists must train workers to apply appropriate insect and disease control substances, and also give them information that will help them protect their health.

Sahel. Under CTTA, a two-person team conducted a mid-term evaluation of the A.I.D.-funded Sahel Regional Institutions Project. The evaluation focused on donor-Sahelian collaboration and the two secretariats responsible for fostering such collaboration. The evaluation team made the following key recommendations toward continuing the project.

- Better information and data are key to helping Sahelian peoples discover and capitalize on their options. With its experience in information brokering, CILSS/Club is in an excellent position to undergird the nurturing process with a Sahel Development Networking System (SDNS).

- SDNS does not call for new institutions, large staff build-ups, or significant new budget outlays. The SDNS is largely a matter of actualizing unused potential within the CILSS/Club system, breathing life into relationships and linkages that exist only on paper, and bringing more discipline to the nurturing process.

- The CILSS/Club Secretariats should concentrate on compiling investment information, serving as a clearinghouse for development insights, and functioning as regional development interlocutors.

- As a compiler of investment information, CILSS/Club should rely more on the Institute of the Sahel (INSAH) for applied research coordination, and eventually regard INSAH as the central data base source for elaborating and revising all Secretariat strategies and initiatives.

- There should be a clearer division of labor between the CILSS Secretariat and INSAH. CILSS should assume responsibility for policy analysis, strategy formulation, and resource mobilization. INSAH should have responsibility for collating, synthesizing, and disseminating project results and research information through Sahelian networks.

- The CILSS/Club/INSAH should initiate and maintain a region-wide inventory of research activities currently being carried out in the Sahel in the two CILSS/Club mandate areas. The

  Donor Advisory Group should then work with the Secretariats to identify gaps in the research effort and establish priorities for future donor collaboration on research.

**Portugal.** In an effort share the lessons learned from CTTA with other institutional donors, CTTA fielded a two-person team in 1991 for two weeks to design an agricultural communications activity for the Tras-os-Montes region of northeastern Portugal, at the invitation of the President of the High Commission for the Development of Northern Portugal. The team proposed that an agricultural communications activity to be carried out with the communications unit of the Universidad do Duoro e Tras-os-Montes, in collaboration with research specialists and extension agents in the region. The proposal was subsequently forwarded to the Luso-American Foundation for possible funding.

## RESEARCH AND EVALUATION

The following section presents selected examples of findings from formative and summative research conducted in CTTA pilot countries.

### Honduras

**Formative research.** Formative research, or developmental investigation, was routinely conducted in an effort to better understand the interests, needs, knowledge and skill levels, and a range of other characteristics and behaviors of target audiences in the Comayagua pilot region. One such example was an evaluation conducted to quantify the audience of *La Milpa*, the radio program produced with assistance from CTTA. The research found that listenership had increased from 64 percent of Comayagua farmers who owned radios in 1988 to more than 79 percent of farmers in 1989.

The radio listenership survey found that:

- 40 percent of listeners had recommended *La Milpa* to another farmer,
- 7 percent remembered at least one agricultural recommendation they had heard on the program, and
- 63 percent of those farmers had tried one recommendation.

The survey estimated that *La Milpa* regularly reaches more than 16,000 farmers and rural families. Extension workers can directly serve only about 2,200 farmers in the area. The report praised *La Milpa* for "becoming more dynamic, more participative, and more responsive to the necessities of the farmers, livestock growers, and rural women in the region."

**Summative research.** A summative evaluation of the effectiveness of the CTTA process for transferring agricultural and soil conservation technologies to basic grain producers was conducted in Honduras during three years between 1987-1989.

The evaluation presumed that exposure (E) leads to knowledge (K), and knowledge leads to skills development and behavior change (P). This line of causality is expressed as:

$$E \rightarrow K \rightarrow P$$

When using this line of causality as an analytical tool for evaluating the impact of CTTA, certain definitions and considerations are in order.

- **Exposure** refers to level of contact with technological information about farming practices that was disseminated through different media by the MNR as part of the CTTA intervention. The media considered in this analysis were interpersonal extension activities, print materials, and radio.

- **Knowledge** refers to the technological information about farming practices generated and disseminated by MNR. The intent was not to determine if farmers knew more about farming practices after the intervention. Rather, the intent was to determine if they knew more about the practices that MNR was recommending through CTTA. In this evaluation, knowledge was defined as correct recall of these recommendations.

- **Skills development and practices** were defined as behaviors that complied with the recommendations about certain farming practices made by MNR. All behavioral indices used in the analysis were indices of compliance with those recommendations. This was an important distinction. The behaviors being recorded were specific to the recommendations, not simply a measure of whether farmers were following reasonable procedures.

This paradigm still had to account for several intervening variables that could influence outcomes.

First, the MNR extension service has been in place for a number of years. Basic grain growers at the project pilot site had been directly and indirectly exposed to technological information generated and disseminated by MNR. From the evaluation perspective, it was important to determine the incremental contribution CTTA made in increasing exposure, knowledge, and practices. It was also important to consider that contributions by CTTA did not exist in a vacuum, but would be observed against the backdrop of many other interventions and a history of prior extension efforts.

Second, recommendations (i.e., messages) changed over the years, even during, and partially as a result of, project implementation. The 1989 recommendations were the most updated and elaborate available, and therefore were used as the benchmark against which to measure change which had occurred during the preceding 28 months. They included, but were not limited to, farming practices that had been developed by some of the most advanced and successful farmers and sometimes improved by MNR researchers. Using the 1989 data assumed the need to assess how the less successful farmers emulated those who had experienced greatest success. The sample was drawn to include "successful" and "unsuccessful." The greatest change in behavior was expected to have occurred for "unsuccessful" farmers. The more successful a farmer was in 1987, the smaller was the gap to overcome, both in terms of knowledge and compliance to advocated practices.

Third, farmers' socio-economic characteristics and status have an impact on knowledge, practices, and, as a result, on yields. Due to the longitudinal design adopted for this study, farmer age, educational level, gender, marital status, family size, and socio-economic status were kept constant while studying the relationships of the exposure-behavior causality line.

Fourth, farm features such as size, extent of irrigation, degree of slope of terrain, and soil quality may have influenced both practices and yields. These factors were kept constant in the statistical analysis.

**Hypotheses Tested.** The following hypotheses shaped the study:

1. CTTA would increase coverage of the extension system in the pilot area.

2. Coverage increase would be a result of increased access to technical information via interpersonal contact with extensionists, print materials, radio broadcasts, or a combination thereof.

3. Farmers who were exposed to extension information would show increased knowledge of recommended practices.

4. The greater the degree of exposure, the greater the changes in knowledge and practices would be.

5. Changes in farmer knowledge and behavior in agreement with MNR would persist even after removing the effects of prior knowledge and practices.

**Methodology.** A longitudinal investigation was carried out in four of the ten extension districts in Comayagua. Districts were selected to represent the different production systems throughout the region. Basic grain growers within the districts were randomly selected. Two measurements were conducted, one in 1987 that coincided with CTTA Project start-up, and another in 1989 before project close-out. In 1987, researchers interviewed 755 farmers; in 1989, 610.

Analyses showed significant changes in exposure and adoption that could be attributed to CTTA interventions.

- There were statistically significant increases in exposure. Pre-post comparisons indicated that aggregate exposure to technological information through CTTA interventions doubled for corn, beans, and rice producers, and tripled for soil conservation. Much of the increase among corn and bean producers was attributed to the role played by radio. Among rice producers, interpersonal contact with extension workers was most effective.

- There were statistically significant increases in knowledge. Aggregate knowledge of MNR recommendations promoted by the CTTA Project increased four-fold among corn and bean producers, and two-fold for rice growers. In addition, there was a 60 percent increase in knowledge about soil conservation practices.

- Compliance with recommendations made by the extension system increased with CTTA support. Pre-post comparisons indicated that there was a 6 percent increase in mean aggregate compliance among corn producers, a 23 percent increase among bean producers, and an 8 percent increase among rice producers. In addition, there was a 55 percent increase in mean aggregate compliance with soil conservation recommendations for sloping land, and a 13 percent increase with those that can be applied on any farm, independent of topography.

- Aggregate measures provide a general picture of CTTA impact. A breakdown of results by type of practice shows that the greatest increase in compliance among corn producers was observed for fertilization practices (30 percent). For bean growers, the greatest single increase was observed for plant protection practices (80 percent). And for rice producers, the greatest change occurred in planting distances (290 percent). Recommendations for minimum tillage, for any type of soil, demonstrated the largest gain in compliance (50 percent).

- Aggregate exposure is related to aggregate knowledge, and aggregate knowledge is related to aggregate compliance.

- The relationship between aggregate knowledge and compliance remains constant when the influence of pre-CTTA knowledge and experience is removed.

The findings of this evaluation suggest that farmers are more likely to adopt those practices that make the most economic sense, and are relatively low risk and low cost. Moreover, it demonstrates that using social marketing principles can successfully enhance the effectiveness of national agricultural extension programs.

The results of employing the CTTA process were impressive. Increases in exposure appear to have been generated without significantly expanding recurrent costs in MNR extension activities. CTTA implementation did not require augmenting the number of extension staff working in the project region. Instead, the project required only additional costs for the expatriate communication personnel (provided by CTTA) who introduced the process and supported all extension activities.

**Peru**

In the pilot zone of Huaraz, CTTA was able to greatly increase the number of farmers reached. At the outset of the program, the national extension served only 4,400 farmers in the region. Through the CTTA media campaign, the number of farmers served nearly quintupled, to 21,000.

Further, surveys indicated that most farmers correctly remembered and many applied at least some of the production recommendations. Table 1 presents the results of the final project survey for corn and potatoes. This survey recorded how many farmers heard the technical recommendations, how many remembered those recommendations correctly, and how many

correctly carried out the recommendations. The evaluation findings reflect the expectations that more farmers would hear the recommendations than would remember them and that more remembered them than put them into practice.

Table 1

Percentages of farmers in the Huaraz pilot zone who heard, recalled, and performed recommended procedures correctly

| Technology | Heard advice (%) | Recalled advice (%) | Performed correctly (%) |
|---|---|---|---|
| **Corn** | | | |
| Seed selection | 48 | 33 | 17 |
| Land preparation | 61 | 56 | 46 |
| Type of fertilizer | 64 | 47 | 47 |
| number of applications | 67 | 59 | 43 |
| timing of applications | 58 | 52 | 36 |
| **Potatoes** | | | |
| Seed selection | 57 | 38 | 34 |
| Land preparation | 76 | 73 | 58 |
| Type of fertilizer | 70 | 45 | 28 |
| number of applications | 70 | 56 | 44 |
| timing of applications | 68 | 56 | 44 |

In sum, the final evaluation of the field-level impact of CTTA activities demonstrated that many more farmers heard and acted on the technical recommendations than ever before and that, despite adverse conditions, those farmers recognized the potential benefits of the program.

Although not considered a summative evaluation, CTTA also completed a qualitative study of the impact of the CTTA intervention in the pilot zone. Farmers were interviewed to learn if the intervention had changed their behavior, attitudes, and perceptions. In June 1987, baseline information was gathered for a summative evaluation. But economic problems later led to the withdrawal of Applied Communication Technology (ACT) from the CTTA evaluation in Perú and violence in the countryside prevented another survey from being carried out. It was therefore

decided to discontinue the evaluation. Nonetheless, it was still necessary to carry out some sort of evaluation to document CTTA impact in the pilot zone.

Accordingly, a study was designed to be based on interviews carried out during the month of May, 1990 in three communities of the pilot area. Different guidelines were designed for interviewing corn and potato producers. The study sought to collect information on the level of knowledge and recall of the recommendations disseminated, the extent to which they had been adopted, the results obtained as a result of applying the recommendations, and producer perceptions of the various media used and of the intervention in general. Further, the study recorded farmer expectations and limitations regarding the adoption of the technologies.

The study analyzed the impacts of the communications strategy developed under the project on the targeted farmers. Radio, highly illustrated print material, and interpersonal communication were the predominate vehicles for technology transfer in the pilot area of Peru. The project significantly increased knowledge transfer, inasmuch as most of the producers interviewed were able to correctly recall some of the technological recommendations disseminated. Unfortunately, the adoption effort was less successful in completely overcoming local economic constraints, which were compounded by the national economic crisis, a situation described by one corn producer as follows:

> *"... I listen to "Amanecer Campesino" (Campesino Daybreak), because the community leaders suggested I do so; I like it because it is broadcast in Quechua, which makes it easy to understand. I have used the techniques of soil preparation and planting in furrows, but I do not have enough money to buy products".*

Even with persistent economic constraints, however, farmers were able to perceive the advantages of the proposed technologies and the immediate results of the applying certain of them.

**Socio-economic characteristics of farmers.** The study considered such socio-economic characteristics as age, literacy, and land ownership/cultivation. For potato and corn farmers, age predicted no significant differences in new technology adoption (Table 2). Data did indicate that adoption decreased slightly after age 38.

Table 2. Distribution of farmers by age, crop and technology use, Huaraz, Peru.

| | CORN | | POTATOES | |
|---|---|---|---|---|
| Farmer Age | Used recommendations | Did not use recommendations | Used recommendations | Did not use recommendations |
| 16-25 | 1 | 2 | 1 | 1 |
| 26-35 | 5 | 4 | 3 | 4 |
| 36-45 | 7 | 5 | 6 | 4 |
| 46-55 | 1 | | 2 | 4 |
| 56-65 | | 1 | | |
| TOTAL | 14 | 12 | 12 | 13 |

Of those farmers interviewed who adopted the technological recommendations, 100 percent of corn producers and 92 percent of potato growers had some degree of education and knew how to read and write. Among those who did not adopt the recommendations, 67 percent of corn producers and 54 percent of the potato farmers knew how to read and write (Table 3).

Table 3. Distribution of farmers by literacy, crop and technology use, Huaraz, Peru.

| | CORN | | POTATOES | | |
|---|---|---|---|---|---|
| Literacy | Used recommendations | Did not use recommendations | Used recommendations | Did not use recommendations | Total |
| YES | 14 | 8 | 11 | 7 | 40 |
| NO | | 4 | 1 | 6 | 11 |
| TOTAL | 14 | 12 | 12 | 13 | 51 |

Farmers of both crops who adopted recommendations reported owned an average of three hectares of land, whereas those who did not adopt owned an average of two hectares. It must be noted that these socio-economic characteristics are those of the producers interviewed and are not of a statistically selected sample.

**Knowledge of recommendations.** CTTA Peru made substantial progress in transferring knowledge. Most of the farmers interviewed correctly recalled some of the technological recommendations disseminated, especially that for land preparation for planting corn and

potatoes. They also were able to recall the advantages of correctly performing this task. Some potato growers described the technologies in the following term.

> "It is good, because the more passes you make, (the better) you eliminate weeds, pests and diseases."

> "It is useful because it eliminates pests and when the land is not prepared well, it results in a loss of time, seed, fertilizer and labor."

Some of the corn farmers said:

> "It is very good, because before I only made one pass and production was low."

> "I received the recommendation at the proper time, and it has been good for production. It is much better when you prepare the land well, the crop grows faster and without difficulties."

Even producers who had not used the recommendations recalled some of them, especially those which do not require an outlay of cash, such as land preparation, the proper way to plant corn, and various cultivation techniques.

**Adoption of recommendations and related constraints.** Principal constraints related to technology transfer in the pilot area centered around economics and level of knowledge. Data from the interviews showed that CTTA partly overcame the knowledge constraint. For example a potato grower said:

> "I listen to the program *Amanecer Campesino*. The advice given is very good. It is good to know the proper size of the seed, planting distance, hilling, fertilization, and control. But I cannot do it in the same way as indicated on the program because I have no money to buy the expensive products recommended. I cannot buy or use them."

A corn producer said:

> "I listen to *Amanecer Campesino* because the community leaders suggested I do so. I like it because it is in Quechua, which makes it easy to understand. I have used the techniques of soil preparation and planting in furrows, but I do not have enough money to buy products."

These opinions demonstrated the importance of providing technologies that are suited to the characteristics and needs of farmers, if those technologies are to be adopted. In selecting technologies to transfer, CTTA staff considered the low level of economic resources of farmers in the pilot zone. Despite rapidly changing national economic conditions, the project managed to achieve substantial levels of adoption of recommendations, even of those requiring

inputs, because the selection of technologies responded to urgent problems identified by farmers, particularly those regarding insect and disease control.

Insect and diseases were cited as the primary problem affecting corn and potato production in the zone. Much of the transfer effort focused on these problems. To prevent/control pest attacks, it is important to use good seed, prepare the land well, and practice proper cultivation. Pest attacks are endemic, however, a fact which often makes it necessary to use chemical products for control. CTTA found that farmers tended to use chemical products indiscriminately. Usually, they were unaware of the proper doses, proper timing and frequency of application, and the most appropriate product to use.

CTTA considered all these issues while preparing the recommendations to be disseminated for insect and disease control, which encouraged many producers with economic resources to put them into practice. Farmers who said they had adopted the recommendations were asked to identify the advantages of using them. Following are some of their thoughts.

Corn farmers said:

> "When you plant in furrows corn is easier to fertilize, hill, and irrigate and you use less seed."
>
> "Before, I used only one fertilizer. Now I know how to combine different fertilizers and I get better ears of corn.
>
> "Before, I used to do the weeding in my own way. Now I weed at the proper time and get a better corn plant, which grows better as a result of the hilling."

Potato farmers said:

> "The (planting) distance recommended is best because if you use a greater distance, you waste space and if you use a smaller distance, the runners do not develop properly."
>
> "Before, I spread the fertilizer too close to the plants and had problems."
>
> "The recommendations are very useful because by making the hills high, I get healthy potatoes with little potato worm and diseases."
>
> "Potato worm has almost disappeared through using the recommendations."

**Results of using the recommendations.** It was not possible to quantify the results of the intervention in terms of yields. However, those producers interviewed who had used the recommendations provided information about their results after applying some of the

recommendations. Farmers who had heard the recommendations but had not used them also considered their possible benefits and effects on yield.

Corn farmers said:

"By weeding before fertilizing, plants grow better because the weeds do not take away the fertilizer. And, hilling keeps plants upright so they won't fall down and cover up the fertilizer."

"When I applied the pesticide it provided good results, and I obtained healthy plants. When I do my practice work, I make an effort to buy the recommended product even though I lack money."

"I think that proper preparation helped me, because I did not have as many problems with pests and I was able to save on chemical products."

"This year, my harvest was smaller due to lack of rain, but if I hadn't used the techniques recommended, I wouldn't have harvested anything."

"I prepared the land well, I made good furrows, I used good seed, and I harvested a little more than last year."

"I listened to the radio and I had my *Guide*. Thanks to that, I no longer lose my crops, although I was not able to fertilize because there was no fertilizer and I did not have enough money to control the maize ear worm."

Potato farmers said:

"the recommendations given for planting and seed selection provide good results when carried out on the farm."

"Because I planted at the proper distance, like Don Hilaco says, I have got good results, with larger potatoes."

"The recommendations were great, just as though it were my father. The plants have been growing well."

"The recommendations are useful because they improve our production."

"If we used everything recommended on the radio, we would have a good harvest, free from diseases."

"I listen to *Amanecer Campesino* but I do not put the recommendations into practice because the products recommended are expensive and I have not been able to buy them. But, I know they are good because my neighbor had good results with them."

**Behavior change.** The clearest example of behavior change brought about by the intervention may well have been for the practice of making three plowing passes before planting to properly prepare the land and the practice of planting corn in furrows. Poor land preparation for planting potatoes and the way in which corn was being planted constituted two of the most important problems identified by researchers, although not by farmers. In both cases, adopting the recommendation implies a substantial behavior change because each new technique requires greater effort. Before the intervention, potato farmers tilled once or twice before furrowing in preparation for planting. They felt it was sufficient to merely turn over the earth. Researchers contended that this practice was inadequate because the soil was not sufficiently broken up or aerated, thereby creating ideal conditions for certain insect pests and diseases. Accordingly, the recommendation was to make at least three passes before furrowing.

Although the recommendation did not imply something totally new for the farmers, it did imply more work and more hours of plowing with a team of oxen, which often are rented or borrowed. To encourage them, farmers were provided with information about the advantages of properly preparing the land: more plants would sprout and the plants would produce more potatoes, and exposure of the soil to weather and birds would help control pests.

Data from previous studies served as guidelines for appreciating the degree of behavior change. In the baseline research carried out before this study, 17 percent of farmers said that they made three or more passes. By the first formative evaluation, this had increased to 49 percent, and by the second had increased to 58 percent.

Before the project intervention, farmers customarily planted corn by tilling the soil with a pair of oxen into rows spaced at 25 and 30 cm, following which women would drop a seed at every 15 to 20 cm. The return trip with the team of oxen would cover the seed with soil.

When the plants began to germinate, they would sprout any which way. When irrigating, the producers would flood the entire parcel of land because there were no furrows in which the water might run. Cultivation and pest control were difficult. The corn researcher insisted that changing this behavior was a basic requirement for the subsequent application of other technological recommendations. It would be necessary to plant corn in furrows 80 cm apart with a distance of 60 cm. between plants, placing between three and four seeds per pocket. This represented a major change for farmers--the new practices required more effort and were contradictory to tradition.

The baseline research showed that only 0.5 percent of farmers used the correct distance between furrows and none followed the correct recommendation for planting distance. Subsequent research showed that 28.1 percent of corn farmers planted in rows and used the proper plant spacing.

**Changing attitudes.** Baseline data showed that farmers had a high level of confidence and credibility in new technology and in the ability of the extension worker to teach them about that technology. But extension workers were unable to reach all the farmers.

To address this problem, CTTA sought to use radio and graphics to support and reinforce efforts of extension workers. Despite that the extensionists could not visit each farmer, these communications media could help them broadly disseminate their teachings augmented, of course, by occasional visits. To establish and maintain a relationship between the media and extension workers, extensionists were encouraged to attend the Community Assemblies where farmers were invited to listen to *Amanecer Campesino* and received graphic materials.

Producers subsequently understood that technical assistance did not consist merely of a visit by a technician, but also of many other media. As one producer said:

> "The radio, together with the *Guide*, help the campesino. We learn more because even though the technician doesn't come here, the radio program enables him to reach remote areas to teach us."

**Perceptions regarding the intervention.** The cornerstone for applying the CTTA methodology is the producer. His or her characteristics, knowledge, attitudes, and practices and responsiveness to the medi are of key to designing a successful communications strategy for technology transfer. One of the ways in which the impact of the CTTA intervention was evaluated was to record the farmer's perceptions of the technologies selected and the media used to transfer them. About the messages, farmers said the following:

> "I think they are good because we learned new things and will thus teach our children how to work using the new techniques."

> "They are good. Previously, we had poor harvests but, by following the recommendations, production has been good."

> "There are many advantages to them. Since I began to work follow the recommendations, I have increased my production."

> "They are very useful. By following them, we have improved our crops."

> "They are very interesting. The ears of corn are bigger now, as are the kernels."

> "By following the recommendations, we apply chemicals correctly. Previously, we did not apply them well and had poor harvests."

About radio, farmers said:

"The recommendations are good and besides, they are given in Quechua."

"The information given over the radio and that provided in the course are similar. That is why I consider my radio to be my friend at home."

"I have listened to *Amanecer Campesino* since it started, every single day. It provides me with the right information at the right time and is sort of like the extension worker. I keep a watch over my field in accordance with the information I receive over the radio."

"I have been listening to the radio program for three years, five times a week. It teaches us and makes us remember."

"I listen to *Amanecer Campesino* almost every day. I like the recommendations provided, which are easy to understand. We learn new things and our harvests are good. There are many advantages, but what is most important is that we have learned a lot. I hope we can continue to receive new techniques."

"The radio recommendations are necessary for farmers because, lately, the extension worker hasn't been coming."

About the highly illustrated print materials distributed through CTTA, farmers said:

"The recommendations are useful. The *Guide* makes it easy to understand because of the drawings."

"The *Guide* is a source of consultation, like a teacher. If I have a question, I consult my *Guide*."

"My son, who is in school, reads the *Guide* and explains it to us."

Farmers also were enthusiastic about courses, saying:

"They are good because we can learn by ourselves without the need for visits by the extension workers."

"They help farmers improve production and prepare their land differently from the way we used to do it. There should be more courses."

"The course provided detailed explanations and helped us learn to cultivate better than before."

Table 4. Summary of data collected during the first formative evaluation, Huaraz, Peru. Information and adoption levels of proposed behaviors.

| Recommendations | Received Recommendations | Correctly Recall Recommendations | Applied Recommendations | Correctly Applied Recommendations |
|---|---|---|---|---|
| Method of sowing corn | 56.0% | 54.3% | 43.5% | 41.8% |
| Planting distance of corn | | | | |
| Between plants | 61.4 | 23.4 | 43.5 | 16.3 |
| Between furrows | 61.4 | 26.6 | 43.5 | 17.4 |
| No. of corn fertilizations | 58.7 | 56.0 | 46.7 | 44.0 |
| When to fertilize corn | 54.9 | 50.0 | 38.6 | |
| Type of corn fertilizers | | | | |
| 1st fertilization | 57.1 | 33.2 | 40.8 | 23.4 |
| 2nd fertilization | 57.1 | 45.1 | 40.8 | 34.8 |
| Control of Cogollero Worm | 45.1 | 32.6 | 21.9 | 16.8 |
| Soil preparation for potato | 69.6 | 60.3 | 55.4 | 48.9 |
| Prevention of potato diseases | 38.0 | 0.5 | 29.9 | 0.5 |
| How to obtain samples for soil analysis | 9.8 | 9.8 | 4.9 | 4.9 |
| AVERAGE | 51.4% | 35.6% | 37.2% | 25.8% |

*Total farmers surveyed in Pilot Zone, Marcará, December 1987.

TABLE 5. Summary of data collected during the second formative evaluation, Huaraz, Peru. Information and adoption levels of proposed behaviors.

| Recommendations | Received Recommendations | Correctly Recall Recommendations | Applied Recommendations | Correctly Applied Recommendations |
|---|---|---|---|---|
| Fundamental problems of corn | 80.9% | 54.5% | -- | -- |
| Selection of corn seeds | 47.8 | 32.6 | 36.0% | 16.9% |
| Methods of sowing corn | 61.2 | 56.2 | 50.6 | 46.1 |
| Planting distance (corn) | | | | |
| Between plants | 61.8 | 34.8 | 47.8 | 26.4 |
| Between furrows | 61.8 | 36.5 | 47.8 | 28.1 |
| No. of corn fertilizations | 66.9 | 59.0 | 53.4 | 43.3 |
| When to fertilize corn | 58.4 | 52.2 | 40.0 | 36.0 |
| Type of corn fertilizer | | | | |
| 1st fertilization | 63.5 | 37.6 | 46.6 | 32.0 |
| 2nd fertilization | 63.5 | 47.8 | 46.6 | 42.7 |
| Control of Cogollero Worm | 70.8 | 39.3 | 44.9 | 19.7 |
| Control of Spindleful Worm | 56.2 | 28.1 | 31.5 | 15.7 |
| Soil preparation for potato | 76.4 | 72.5 | 65.2 | 58.4 |
| Selection of potato seeds | 56.7 | 38.2 | 50.6 | 33.7 |
| When to fertilize potato | 68.0 | 55.6 | 55.6 | 44.4 |
| Type of potato fertilizers | | | | |
| 1st fertilization | 70.2 | 44.9 | 56.7 | 33.7 |
| 2nd fertilization | 70.2 | 46.6 | 56.7 | 23.0 |
| Control of Rancha | 52.8 | 41.6 | 42.1 | 37.1 |
| Control of potato-kuru | 60.7 | 23.0 | 44.9 | 17.4 |
| Correct use of pesticides | 55.6 | 37.1 | 44.9 | 25.8 |
| AVERAGE | 63.6% | 44.8% | 48.4% | 33.4% |

*Total number of farmers interviewed: 178.

## Indonesia

**Malang pilot communication site: farm family survey.** CTTA completed a developmental investigation survey of farm families in the Malang pilot communication site. The survey sought to:

- provide information to help tailor communication interventions to local conditions and to meet local needs,
- introduce sample areas in which studies would be conducted during the pilot project and in which results of communication interventions would be monitored, and
- design and field test a developmental investigation methodology which, with appropriate modifications, might be applied in other areas of Indonesia.

Two kinds of information were collected:

- information directly related to the messages and media that constituted pilot project communication interventions, and
- information that provided background for making appropriate choices for the interventions.

Information was collected from farm families in three areas of East Java on subjects such as cropping patterns, sources of agricultural information, mass media access and habits, land tenure, educational levels, and occupational patterns. Data collection techniques included household surveys, case studies of selected households, and focus group discussions. The survey team also met with Department of Agriculture officials and researchers from the Malang Research Institute for Foodcrops (MARIF).

Analysis of data collected during the survey led to an extensive set of recommendations. Major recommendations included:

- incorporate agricultural messages as part of ongoing radio programming and traditional oral performances;
- deliver messages in local languages rather than the national language;
- develop messages that emphasize graphics but include short, simple text; and
- promote new technology through informal rather than government-sponsored organizations.

**Serba-Serbi Palawija.** CTTA contracted with the Center for Development of Social Studies at Brawijaya University to evaluate *Serba-Serbi Palawija* and other communication activities. Selected findings from focus group discussions as follows:

- Farmers who had not listened to *Serba-Serbi Palawija* did not know about it, or felt that agricultural broadcasts, in general, were not designed for their needs.

- Women farmers said recommendations should be broadcast at least two weeks before they should be implemented.

- The program should give more information about how to maximize profit from the cassava harvest.

- Mini dramas should include no more than two characters, and include livestock sounds and other farm noises in the background.

- The Bahasa Indonesia introduction to the mini dramas is difficult for listeners to understand.

CTTA staff eventually conducted a more complete analysis of the formative evaluation results and adjusted programming accordingly.

## SPECIAL STUDIES

### Honduras Pilot Project Institutionalization Study

The report of this study presented the results of an institutionalization assessment of CTTA Project activities in Honduras during 22 months from February 1987 to December 1988. It provided a cross-sectional view of accomplishments at the different levels through which the extension system operated: agency, regional, and national. Results of the assessment suggested that CTTA introduced significant changes in extension activities in the Comayagua pilot region. Before CTTA, extension activities were planned vertically, emphasized the farm and not the farmer, were concerned with physical outputs rather than learning objectives, and were based essentially on personal interactions with farmers. The changes that occurred can be best summarized by quoting three extensionists who explained the differences between the working environment before and after project implementation. One extensionist said,

> *In the previous system, priorities were determined by the technician through visual observation or as a result of his experience in the field. In the current system, communities and farmers participate in expressing their problems and the needs of their crops.*

Another extensionist said,

> *CTTA has organized us. It helped us get organized to implement activities such as surveys and diagnosis, and also to focus on human aspects. We learned how to reach the farmer, and how to do transfer projects, flyers, and newsletters. Nothing of that existed before.*

A third extensionist said,

> *We do not follow up the farm anymore. We follow up the farmer. We have to train the man.*

The agency-level audience analysis that CTTA supported helped agencies redefine their geographical priorities. New communities of basic grains producers are being served which have high potential for benefitting from technology transfer initiatives. Basic grain producers are the primary clientele for public sector extension activities. This redefinition of priorities may have implications related to the cost-effectiveness of the service delivery system in the pilot region.

CTTA influenced research activities, including the development of a research agenda for some agencies. It also helped research and extension programs in the pilot region to identify and disseminate technological options that would have cost implications for producers. Both research and extension need to develop and disseminate information about technologies that are applicable for subsistence rather than commercial farming. Institutionalization accomplishments are most obvious at the agency and regional levels, where support for CTTA always has been strong.

There also were some significant national-level accomplishments. A service delivery methodology for which CTTA is partially responsible, and which includes a CTTA approach to extension, was adopted as the national service delivery methodology. CTTA activities also were expanded to new regions. However, much remains to be accomplished to ensure that the new methodology is universally adopted and correctly and continually applied. Additionally, the DCA capacity to implement the methodology must be strengthened and corresponding funding identified. Present GOH funding constraints will likely make it necessary for DCA to rely partially on external funding (USAID and other donors) for its operating budget.

Three key factors were determined to have contributed to CTTA success: the environment where CTTA was implemented, the approach adopted to implement the project, and the characteristics of the source from which changes emanate.

The director of the administrative region where CTTA was housed was an innovator and greatly committed to reform, which included improved and expanded extension coverage, increased contact with extension clientele, and development of an improved institutional message. CTTA was implemented through an additive approach. It first sought to introduce a few core changes, upon which it built larger and more comprehensive modifications. CTTA's first focus was at the agency level, where positive impact was quickly achieved, thus building confidence in the methodology. CTTA also responded to the regional goal to simplify the developmental investigation, and participated in designing the Unified Methodology for the Delivery of Services. The expatriate communication advisor played an important leadership role in the implementing agency.

**Attitudinal Change Among Extension Workers**

Interviews were conducted with 22 of 32 extensionists with the Honduras Ministry of Natural Resources (MNR) who worked with CTTA to identify attitudinal changes that occurred under CTTA and to link them with project actions. CTTA interventions had substantial impact. Nevertheless, the improvements in extension were not immediately apparent because linkages between project interventions and observed changes in field staff attitudes are complex and because the interventions involved numerous actors--farmers, extensionists, MNR supervisors, and researchers.

The CTTA Project was both timely and relevant. At the institutional level, MNR regional staff in Comayagua were dissatisfied with traditional extension techniques. Regional program management was poised for change, and was eager for a new approach that would increase extension effectiveness. Thus CTTA, which promised to work throughout with farmers--from initial diagnoses of needs, through message delivery, to follow-up and evaluation--represented precisely the new approach needed. MNR and CTTA personnel collaborated to develop an extension methodology based on farmers' needs that not only increased production and productivity at minimal cost to farmers but also maximized use of MNR resources with little or no increase in staff and equipment.

At the field level, extension staff lacked--and those working outside the Comayagua region still lack--the ability to formulate strategies that give direction and focus to their work. CTTA provided the field staff with skills training and experience that empowered them to make their work their own. They learned to organize, plan, and exercise self-reliance in what they had to offer, while at the same time appreciating what they could learn and contribute as members of an interdisciplinary team.

Before CTTA, farmers expressed little confidence in the technological recommendations of MNR personnel. Extensionists lacked credibility because the technology they promoted was not always adapted, or adaptable, to specific farm settings and circumstances. Through the CTTA methodology, field staff learned to work with farmers to define the problems and evaluate their solutions. The farmers, in turn, developed new respect for the field staff, whom they now perceive as genuinely aware of and interested in addressing their needs.

In short, the CTTA approach is participatory, integrative, and practical. It is participatory in that it incorporates the farmer in the extension process. In doing so, the approach integrates research, extension, and production at the level of the small-hold farmer, a long-held aim that has proved difficult to achieve. And, the approach is practical because it focuses on actual problems in farmers' fields and uses only those resources that are available in the Ministry.

The linchpin of this approach is the active participation of, and interaction with, the target audience, the farmer. CTTA promotes continuing communication and feedback, both vertically and horizontally. Through CTTA training, the Comayagua MNR extension staff internalized this principle. Moreover, the approach is being incorporated into and extended within the MNR through the adoption of a Unified Methodology (UM) that was developed by the MNR in view of the CTTA experience. With the adoption of the UM, the CTTA approach will be extended for use throughout the country.

**Marginal and Women Farmers and Extension Services**

This study addressed the extent to which women, especially women farmers, and marginal sectors of the population were included in and benefitted from the CTTA Project through its extensionist activities. The seemingly straightforward topic of the extent to which women benefitted was deceptively complex due to the multi-level and multi-directional linkages that are involved. Women participated in CTTA as employees of the MNR -- extensionists -- or as residents where the project was implemented.

During the preparation of *Attitudinal Change Among Extension Workers in the Communication for Technology Transfer in Agriculture Project*, it became apparent that marginal and women farmers were an important, but often under-served, group among extension service clients in Honduras. As a result of this realization, information collected during the study of attitudinal change was reviewed to isolate those findings that were directly relevant to marginal and women farmers.

The controlling question of the analysis was:

*To what extent have marginal and women farmers participated in and benefitted from MNR/CTTA extensionist activities in the Comayagua region?*

Key components of the question included:

- What is the institutional capacity of the extension service to serve marginal and women farmers?

- How many marginal farmers, particularly women farmers, are reached by present MNR extensionist and home economist activities and to what effect?

The information gathered resulted incidentally from interviews with extensionists and related field personnel and was by no means the result of a comprehensive research design that was conceived to focus directly upon issues related to marginal and women farmers and extension services provided to them. The CTTA Project was envisioned to facilitate technology transfer to all farmers, and did not specifically identify marginal and women farmers as target populations.

In all, 44 interviews were conducted for the study of attitudinal change among extensionists. The information used in this paper was based on the experience, opinions, and perceptions relevant to the current topic that were elicited from those persons during those interviews.

The study concluded that the communities that are most systematically excluded through criterion-based site selection tend to be located in productively marginal areas, have a higher proportion of wage laborers versus small land owners, and have complex land tenure arrangements which usually reflect land scarcity. These points are relevant to gender issues because women landholders and unpartnered female household heads tend to be concentrated in more marginal areas. This was indirectly affirmed many times by the extensionists. They explained that they had worked with groups that included women, but that now they do not work in those areas because they are limiting the number of communities they work in. None of them put the percentage of female participants in farming groups above five percent.

Whereas CTTA and the MNR made formidable advances in communicating with farmers in general, their accomplishments with women and marginal farmers were limited. This is because women and marginal farmers are minor participants in the communities and groups that agricultural extensionists work with, rather than because extension and the project have tried and failed in their endeavors to reach them. Home economists have made modest attempts to address women in their productive and economic roles, but the thrust of their efforts is still on women's domestic and maternal roles. CTTA personnel were aware that women and gender issues, and the broader issue of marginality, were not given adequate attention within the project. Nevertheless, they were constrained in their ability to effect change without the conviction and commitment of MNR personnel.

**Impact of CTTA Extension on Yield and Income in Comayagua, Honduras**

As a recommendation of the mid-term project evaluation of CTTA conducted in 1989, efforts were made to determine if CTTA initiatives had a direct impact on crop production and farmer income. Subsequently, a short-term study was commissioned and conducted in early 1990 to quantify results at the pilot site in Comayagua.

The study was unable to conclusively detect any significant economic or production-efficiency impacts during the short time (1987-1989) during which CTTA activities were underway. According to the author, " Measurable responses to successful extension programs may not surface for several years." A major determinant contributing to the researcher's inability to link CTTA interventions with increases in farmer yields and incomes resided in an early design flaw in the construction of the baseline study, which did not properly target production and income variables.

Moreover, the researchers' findings did not support the qualitative findings presented in the mid-term evaluation report. Here, the evaluators gave anecdotal evidence that CTTA interventions in Peru and Honduras had a positive impact. More precisely, the evaluators "suggest that the CTTA process ultimately increases yields and product quality/value and hence farm income."

**Institutionalization of CTTA within INIAA**

As of project close-out date, the institutionalization had not been consolidated in Peru. However, there were indications that was progressing adequately. This study sought to determine the degree of institutionalization achieved to date and the prospects for consolidation.

Information was drawn from an opinion guide, designed for use by CTTA Project personnel in the 12 participating experimental stations. The guide helped to record, in a systematic way, the perceptions and attitudes of local personnel with regard to implementing the methodology and their overall impressions and opinions. Other sources of information were also used, such as informal interviews held with INIAA personnel involved in the project, both at national headquarters and at the regional experimental stations. A review of institutional documentation relating to the subject also was extremely useful.

One key factor that helped they study capture a complete picture of the process was that the project evaluators had participated in the various stages of project implementation. Many of the opinions and comments made about the project and its components by local personnel and others were recorded in notes taken during countless meetings and discussions during the life of the project.

CTTA implementation met with several difficulties. Inflation seriously limited available funds. At project inception, in July of 1985, the annual inflation rate was 200 percent; in 1989, it was 3,400 percent; and for 1990, the estimated rate was 20,000 percent.

Terrorism also increased, with attacks and raids throughout the entire nation. This made it necessary to restrict the presence of government institutions in rural areas of much of the Sierra, where the pilot project was located.

Another effect of the crises for INIAA was strikes by workers who demanded salary increases. These strikes represented serious constraints, because they hampered, and sometimes halted, project implementation.

With regard to institutional constraints, the restructuring of the Agrarian Sector in late 1987 placed extension under the Ministry of Agriculture, while INIAA was assigned the function of carrying out research on technology transfer strategies. This created an institutional break between research and extension. This organizational change required redesigning the work strategy.

In institutionalization terms, the most significant achievement was that INIAA adopted the CTTA methodology as its own. Thus, implementation of the methodology became a priority activity, with economic resources assigned and responsible individuals designated in each experimental station. Decisions made at the highest management levels made it was possible for twelve different geographical areas of the country to be using the methodology by project end.

Extensionists have commented favorably on the CTTA implementation. They attributed its greatest benefit as being the encouragement of planning of communications activities for technology transfer based on knowledge of actual circumstances. One research director said,

> "We already had a radio program and we were producing pamphlets, but CTTA gave us a new starting point, which is knowledge about the users and, with it, feedback from users. We no longer just throw things out for no particular reason. Rather, we go into the countryside to gather evidence and, then, make articulated and synchronized use of various communications media. With CTTA, we now develop the schedule for message delivery based on the crop cycle."

Although this has been the principal benefit, INIAA and other extension personnel know that to properly plan activities, it is important to follow the methodological steps established by CTTA. In so doing, they have successfully organized themselves around fulfilling their institutional objectives and implementing other activities such as research on technology transfer strategies and evaluating the impact of transferred technologies.

Also considered to be an achievement of considerable value is that INIAA now recognizes the importance of beginning with a knowledge of reality and that the plans and strategies for technology transfer must be developed to reflect local characteristics and conditions and not as a result of top-down directives. One experiment station staff member said:

> "I have learned to place activities in sequence using the CTTA process, including the technique of data gathering in the field and the analysis and interpretation of that data. Such information has revealed to us a reality unknown to those sectors involved in the

problems of production and farmers. Previously, plans and development programs were designed without knowledge of the realities of the environment in which they were to be implemented, or of the capabilities and potential of the producers. This was always done as a function of instructions received from technocratic authorities based on what they assumed to be in the best interests of the producers in terms of their individual development and the development of the zones in which they worked. In addition, CTTA has enabled me to plan and schedule technology transfer activities in priority crops and within the technical-productive process, and to address specific problems as they are discovered by farmers."

At the time of project closeout, such knowledge was guiding the work of experiment station staff within the 12 zones where CTTA was working. Plans were being made for producing media messages that were adapted to the genuine needs and requirements of farmers--not based on the interests of institutional personnel, as has been the case.

"Previously, publications were planned in accordance with the progress and/or results obtained by the researchers in each program, which were often of little importance or no interest to farmers. This progress was the result of projects or experiments the objectives of which were determined by the research program and subsequently generalized at the national level. Radio programs had no direction. Rather, the employee charged with their development prepared them based on whatever written materials were available. Work was almost never coordinated with the researchers or reflected the needs of farmers. No evaluation was ever made of the impact of radio broadcasts, or of the ability of producers to even tune in a program."

According to national personnel, the principal benefit of the CTTA methodology was in the identification of the problems and needs of farmers as a basic element to generating and transferring technology, the identification of technologies with researchers, the management and proper use of communications media, and program planning. The methodology also offers other advantages, as highlighted by one of the engineers responsible for implementation and who, before the reorganization, had been an extension agent.

"With CTTA, we use mass media, which in turn reduces costs in relation to the number of users benefiting from an intervention."

"With CTTA, the technical offerings of the researchers reach the users faster, which in turn makes it possible to integrate user, researcher, and extension worker."

"With the CTTA, the technical content of the messages is adapted to the conditions of users, by virtue of a continuous feedback process."

"With CTTA, media use is evaluated."

### Demonstration Farm Survey

CTTA staff in Indonesia conducted a survey of more than 30 demfarms which were developed under the Secondary Food Crops Development Project (SFCDP) and other projects during 15 or more years. Based upon the survey, staff identified the following six key elements to developing a successful demfarm, arranged in order of importance:

1. an extension worker who actively supports and provides information to the demfarm;
2. a high level of group motivation for participating farmers;
3. timely availability of necessary inputs;
4. a suitable cropping pattern;
5. continued, timely availability of hybrid seed and improved open pollinated varieties; and
6. participating farmers who derive most of their income from secondary foodcrops (not rice) and who do not work seasonally at factories.

### Biological Nitrogen Fixation (BNF) Study

Short-term technical assistance provided to CTTA staff in Indonesia to assess the status of BNF technology and capability in Indonesia, with particular emphasis on the situation in two Sumatera provinces. The study

- assessed the need and potential benefit to farmers of using BNF technology in their crop systems;
- estimated potential benefit from BNF on a farm and national scale, based on soil survey techniques;
- identified constraints to wide adoption and use of BNF technology, including research, human resources development, communication and technology transfer, and industry and institutional development; and
- recommended ways of reducing constraints to implementing BNF technology at the farm level, with special reference to soil fertility constraints in Sumatera.

Successful implementation of BNF technology at the farm level requires that it be economically advantageous to farmers and that an effective partnership exist between research institutes, industry, and extension services. Following are some key recommendations.

- The primary limitations to fully exploiting BNF technology in Indonesia are lack of:

  - a coordinated development strategy for the technology,
  - communication between key institutions,
  - communication between institutions and farmers, and
  - training of extensionists and farmers.

- Inoculant is needed by farmers, especially for soybean production.

- Analysis of the soil survey from West Sumatera and Lampung indicated a positive return to investment in inoculant for almost all cropping systems.

- Excellent inoculant production facilities exist in both government and private institutions. Production potential far exceeds existing demand.

- Inoculant produced in Indonesia effectively establishes BNF under farmer conditions.

- Substantial BNF research capability exists in Indonesia.

- Training and information materials related to BNF should be developed and translated to local languages.

- Extension workers should be trained to diagnose and solve BNF problems in the field. Training should help develop communication and technology transfer skills.

- A network of farmer demonstration trials should be initiated and coupled with demonstrations of other input technologies.

- A BNF group should be formed to develop a formal strategy for delivering BNF technology to farmers. The group should include microbiologists, agronomists, soil scientists, extensionists, farmers, and representatives of farmer groups and industry.

**Mid-term Evaluation**

In April 1989, an independent mid-term evaluation was conducted of activities completed in Honduras and Peru, the two countries in which CTTA was fully implemented. The evaluation team talked with farmers, CTTA counterpart staff, project staff, and USAID project officers; reviewed all the materials that were produced under the project, including those from pilot sites in Jordan and Indonesia; and interviewed CTTA home office staff and A.I.D./Washington project managers.

The report cited CTTA for increasing the credibility levels of farmers in extension and confidence levels between extensionists and researchers. Yields were seen to increase 6 percent

to 10 percent per hectare under CTTA versus 3 percent under conventional extension. Adoption rates increased 10 percent to 70 percent versus 5 percent to 33 percent. In addition, the mid-term evaluation recognized special CTTA Project strengths such as developmental investigation, formative evaluation, and feedback mechanisms to increase adoption of agricultural development processes and technologies. The team made the following major points.

- CTTA integrates research, extension, and farmer client groups into cohesive, functioning systems.
- CTTA helps increase the knowledge base of farmers, field extensionists, and regional and national research and extension leadership.
- CTTA emphasizes client-, group-, and context-sensitivity, thus responding to concrete farmer needs within the context of their current technological, educational, and other levels.
- CTTA promotes a high level of farmer participation.

The evaluators observed that, because agricultural technology is critical to economic growth, improved approaches to technology transfer are imperative. The evaluation team viewed the CTTA approach as one way to enhance technology use and the abilities of extension systems in developing countries.

## DIFFUSION ACTIVITIES

A major thrust of CTTA was to disseminate as widely as possible the findings, lessons learned, and observations from the field to extension systems and members of the academic and development communities. In addition to semiannual progress and management reports, CTTA produced an array of written, graphic, and audiovisual materials. Project staff in the field and home office frequently received requests from around the U.S. and the world for project documentation. For example, a Professor of Telecommunications at Indiana University wrote to CTTA wrote:

> "I have already put them [the CTTA materials] to good use in my seminar, and on behalf of all my students, I thank you very much for the contribution you have made to the enrichment of their learning in development communications."

A partial list of donor and cooperating agencies that periodically requested CTTA materials includes: African Development Foundation (ADF), Food & Agriculture Organization (FAO), Inter-American Foundation (IAF), University of Maryland, International Food Policy Research Institute (IFPRI), Cornell University, International Fund for Agricultural Development (IFAD), Iowa State University, The Johns Hopkins University, University of Delaware, and the International Bank for Reconstruction & Development (IBRD).

### Publications

The following sections briefly highlight some of the principal CTTA publications and other materials. A complete listing of materials can be found in Annex A.

During the early years of the project (1985-1986), several major papers were prepared that described the conceptual foundation of the CTTA methodology. Subsequently, these writings were tested and applied in the four pilot sites. The principal publications were:

*Communication for Technology Transfer in Agriculture (CTTA) Project Overview: The Conceptual Basis*, by Howard Ray, William Smith, and Rachel Greenberg, 1986.

*CTTA Linkages with National and International Agricultural Research Centers*, by Howard Ray, John Axtell, and Douglas Porter, 1986.

*The Application of the Behavioral Analysis to Agricultural Technology Transfer*, by Howard Ray, John Axtell, and Douglas Porter, 1986.

*The Agricultural Communication Process*, by Howard Ray, John Axtell, and Douglas Porter, 1986.

*The Potential Role of Farmer Organizations in Increasing the Productivity and Income-Earning Capability of Small-Farmer Agricultural Systems in the Developing Countries*, by Kerry J. Byrnes, 1985.

*Using Farmer Organizations to Support Communication for Technology Transfer in Agriculture*, by Kerry J. Byrnes, 1986.

In 1990, CTTA produced and distributed a 16-page publication titled *Communication for Technology Transfer in Agriculture*. The publication presented a brief history of CTTA origins, a synopsis of the methodology, and selected examples of project successes, lessons learned, and results from the field. It was distributed to all interested A.I.D./Washington and Mission personnel. The publication and accompanying CTTA documentation list elicited requests from 19 countries for additional CTTA materials.

In 1986, a CTTA Project Manual was prepared to guide pilot project staff in planning, implementing, and evaluating strategies that would provide effective communication support to agricultural technology transfer programs. This draft was prepared to help get initial CTTA pilot projects underway. Field staff in Honduras and Peru also prepared manuals specifically for host country personnel. These manuals improved on the original version and were tailored to local conditions. Both manuals were written in Spanish; the Peru version was later translated to English.

During the two-year project extension, a CTTA planning and implementation manual was written to document the CTTA process based on experiences at the various pilot sites. A draft of the manual was field-tested to determine its utility and appropriateness at a workshop in Esteli, Nicaragua in 1992 for Ministry of Agriculture planners, communication specialists, regional extension directors, and researchers. The audience for this version of the manual is field practitioners, members of academia, international agricultural research centers, and donor organizations. Copies of the final version were distributed along with copies of the CTTA video.

CTTA took the opportunity when possible to promote the project through a variety of channels. In 1991, the Inter-American Foundation published a brief article about CTTA in the summer edition of *Grassroots Development*. The article described the CTTA approach, thus informing non-governmental organizations (NGOs) working in agricultural extension about the techniques successfully pioneered by CTTA. Subsequently. representatives from various national NGOs around the world have requested additional CTTA information.

Additional information dissemination about the project, including news briefs, informal field notes, trip reports, briefing materials, and others were used to inform a broad audience about CTTA successes.

### Training Events and Workshops

Central to the success of CTTA was the heavy emphasis placed on building host country capacity and the transfer of skills to local government personnel to continue the CTTA process after project activities ceased. Numerous workshops and seminars for farmers and national, regional, and local level government personnel (agricultural technicians, communication specialists,

researchers, and extensionists, among others) were conducted in Honduras, Peru, Indonesia, and Jordan. The following sections summarize CTTA training activities.

### Pilot Site Country Training

Table 6 summarizes the number of CTTA-sponsored training events for local extension, research, and communication staff; farmers; and students.

**Table 6. Summary of CTTA Training Activities**

| Country | Number of Training Events | Approximate Number of Participants |
|---|---|---|
| Honduras | 83 | 1,500 |
| Peru | 28 | 840 |
| Indonesia | 27 | n/a* |
| Jordan | 23 | n/a |
| Nicaragua | 1 | 24 |
| **TOTAL:** | **162** | **2,364** |

* Not available.

In addition to these formal training sessions, CTTA resident advisors provided considerable amounts of informal, personalized training to national counterparts on a daily basis.

### Regional workshop

In 1990, CTTA helped design *Mobilizing Agricultural Technology to Meet Central American Challenges*, a week-long seminar sponsored by the Inter-American Institute for Cooperation in Agriculture (IICA) and USAID/ROCAP. The week-long seminar addressed technological change, technological imperatives, and institutional aspects of agricultural technology transfer in Central America.

Two CTTA staff members, along with more than 40 other experts in agriculture and technology transfer who represented national, regional, and international organizations attended. Expert papers presented at the seminar were funded by IICA, ROCAP, and the Academy for Educational Development. Case studies were contributed by several regional organizations. Participants of

the seminar concluded that the traditional approach to technology transfer in Central America needs to be revised and updated to place greater emphasis on farmer participation and the individual national context for technology transfer.

### Video

A 10-minute video titled *From the Ground Up: The CTTA Approach*, was produced in 1992 to highlight CTTA successes. More specifically, the video sought to inform viewers of the significant increases in awareness, knowledge, and adoption of agricultural technologies and practices by farmers that were brought about by employing the CTTA process. The video also portrays the CTTA approach as an effective, innovative, low-cost, multi-channeled alternative to traditional technology transfer and extension models.

### Presentations, Conferences, Symposia, and Other Meetings

CTTA staff delivered numerous briefings and presentations for A.I.D., other international donors and development organizations over the life-of-project to disseminate the results of its technology transfer approach. Presentations on CTTA were made at such gatherings as:

Communications Conference, Cali, Colombia, 1986.

Extension Roundtable, International Center for Research on Women, Washington, D.C., 1986.

CTTA Project International Workshop, San Pedro Sula, Honduras, 1986.

International Communications Association Meetings, Chicago, 1986.

Farming Systems Symposium, Kansas State University, 1986.

CTTA Project, Agriculture Communicators in Education (teleconference presentation), USDA, 1987.

CTTA as a Farmer-led Approach to Technology Transfer, presentation at the International Rice Research Institute and the International Institute of Rural Reconstruction, 1989.

Lectures on the CTTA Communication Methodology, for international development classes at American University, 1989.

Nonformal Education in Agriculture: Perspectives for CTTA Peru, Society for International Development luncheon, 1989.

Other formal settings included the 10th Annual Symposium at Michigan State University in East Lansing, Michigan, at which CTTA presented a roundtable discussion on *Designing for Farmer Participation in Technology Transfer* in 1990. This symposium provided project staff the opportunity to introduce the CTTA approach to a broad range of interested academics and practitioners. Papers presented by CTTA staff were:

- Farmer FSR/E and Sustainability: Lessons from CTTA in Niger,
- Adjusting and Transferring Agricultural Technologies -- Three Examples from Perú,
- Farmer Participation in Rural Radio and Extension: Experiences from Honduras,
- Summative Evaluation for Corn Cultivation--Honduras, and
- Elements of an Agricultural Communication Pilot Project in East Java: Using the Language of the Farmer.

During the two year project extension, CTTA staff gave presentations to World Bank agriculture officers, the Washington Area Professional Anthropologists, graduate students in agricultural extension and education at the University of Maryland, and program officers at the Inter-American Foundation and the Inter-American Development Bank, to name just a few.

## PROJECT MANAGEMENT AND ADMINISTRATION

### Project Contractor and Subcontractors

The Academy for Educational Development (AED) was CTTA prime contractor. Applied Communications Technologies (ACT) and Cornell University served as subcontractors to AED. ACT's principal role was to develop and execute the summative evaluation activities. Cornell University provided technical assistance to an agricultural research foundation (FHIA) in Honduras. Due to both budgetary reductions and implementation difficulties, both ACT and Cornell's roles were substantially reduced over the life-of-project. In 1991, both subcontractors completed their assignments. A list of contractor (and other) personnel involved with CTTA during the seven-year life-of-project can be found in Annex B.

### A.I.D./Washington Project Management

CTTA was jointly designed and funded by three A.I.D./S&T offices (AG, ED, and RD). This unique managerial and funding structure attempted to administratively unite and recognize the interrelatedness of what are, in real world terms, inseparable elements of agricultural technology transfer. However, the independent mid-term evaluation team posited that this management structure resulted in some difficulty in managerial and technical oversight.

The evaluation team noted that one such difficulty was the committee effect, which made decision-making complex and diffuse. Another was the difficulty of inter-office collaboration. Even with the best of will, decision-making and other project actions were quite cumbersome, often producing mixed signals for the contractor. Third, frequent A.I.D. staff turnovers within offices and consequent differences in leadership hindered program coherence.

A fourth factor was the understandably different interests each S&T office brought to and sought from CTTA. Initially, ED served as the lead office, and was the most excited about the opportunity to test potentially powerful new applications of communications strategies it had pioneered in health-related projects. AG pragmatically hoped for a way to expeditiously move both new and shelf technologies into farmers' fields, but provided relatively little financial support and scientific leadership to CTTA. More input from AG might have made for a more agriculturally informed and targeted evaluation plan that would have better served AG goals.

RD demonstrated great interest in the project, viewing the CTTA process as a promising participatory and broadly appropriate alternative to conventional technology transfer approaches; yet RD had relatively limited authority. At the project outset, CTTA's Cognizant Technical Officer (CTO) was housed in ED; subsequently, this position rotated to and remained in RD (now EID) throughout the two-year contract extension.

## Funding

Central funding constraints reduced actual funding for CTTA to less than that originally envisioned. The CTTA Project was created (1984-1985) when A.I.D. resources were much greater than they are today. The original plan was for the project to span eight years, and include nine pilot sites. According to the project paper, funding was scheduled at $19.4 million. Funding arrangements involved three S&T (subsequently R&D) offices -- Education, Rural and Institutional Development, and Agriculture -- plus mission buy-ins where the CTTA concept was to be tested. Tables 7 summarize actual project expenditures for CTTA, while Table 8 compares the contract budget with obligations and actual expenditures.

## Table 7. Summary of Actual Expenditures[1], CTTA Project, 1985-1992.

| | Actual Expenditures | | |
|---|---|---|---|
| Location | Central[2] | Mission/Bureau | Total |
| Home Office | | | |
| AED[3] | 2,019,555 | | 2,019,555 |
| ACT | 332,900 | | 332,900 |
| Cornell | 213,289 | | 213,289 |
| Subtotal | 2,565,744 | | 2,565,744 |
| Long-term Field Sites[4] | | | |
| Honduras | 1,177,860 | | 1,177,860 |
| Peru | 410,378 | 548,565 | 958,943 |
| Indonesia | | 1,896,845 | 1,896,845 |
| Jordan | 66,427 | 165,669 | 232,096 |
| Subtotal | 1,654,665 | 2,611,079 | 4,265,744 |
| Other | | | |
| Honduras/FHIA[5] | | 830,266 | 830,266 |
| Honduras/PRORIEGO | | 34,956 | 34,956 |
| Technology Identification/Africa | 62,646 | | 62,646 |
| S&T/RD (Innovation Activity in Africa/Niger) | 99,985 | | 99,985 |
| ROCAP Regional Network | | 10,895 | 10,895 |
| ROCAP Conference | | 68,247 | 68,247 |
| CDIE (Bogor Inst. of Agriculture/Indonesia) | | 11,487 | 11,487 |
| ANE/TR | 3,832 | 50,001 | 53,833 |
| USAID Sri Lanka | | 16,638 | 16,638 |
| Sahel Evaluation | | 58,976 | 58,976 |
| Bolivia Evaluation | | 66,518 | 66,518 |
| Mid-term Evaluation | 45,794 | | 45,794 |
| Subtotal | 212,256 | 1,147,984 | 1,360,241 |
| TOTAL | 4,432,665 | 3,759,063 | 8,191,728 |

1 The numbers listed in this table are not final. They are estimates made when this report was prepared, November 4, 1992.
2 This column represents S&T (R&D) Bureau funds.
3 This number also includes documentation and diffusion activities, the CTTA cross-site workshop, publications, short-term project management missions to field sites, etc.
4 All long-term field site totals include subcontractor research and evaluation costs.
5 This activity was executed by Cornell University with management oversight by AED.

Table 8. Summary of Project Budget, Obligations, and Actual Expenditures, CTTA Project, 1985-1992.

| Origin | Project Paper | Contract Amount | Obligated Amount | Actual[1] Expenditures |
|---|---|---|---|---|
| S&T (R&D) Bureau | | | | |
| Office of Education | n/a | n/a | 3,839,657 | 3,782,683 |
| Office of Rural Development | n/a | n/a | 649,982 | 649,982 |
| Office of Agriculture | n/a | n/a | 0 | 0 |
| Subtotal | 7,295,000 | 6,281,000 | 4,489,639 | 4,432,665 |
| Mission and Other Bureaus | 12,138,000 | 10,689,000 | 4,167,854 | 3,759,063 |
| TOTAL | 19,433,000 | 16,980,000 | 8,657,493 | 8,191,728 |

1 The numbers in this column are not final. They were estimates made when this report was prepared, November 4, 1992.

## Obstacles to Generating Mission Buy-ins

Initially, the project was intended to have up to nine pilot sites funded by Missions' buy-ins. For a variety of reasons, however, several potential pilot sites -- Swaziland, Malawi, Ecuador, Morocco, and Sri Lanka -- never materialized.

CTTA was the first generation of centrally-funded projects implemented by A.I.D. to include a buy-in mechanism. As a result, there was a fair amount of confusion about the appropriate procedures on the parts of both Missions interested in buying-in to CTTA and A.I.D./Washington in managing and coordinating buy-in activities. The general impression was that Mission personnel were unclear about the procedures for obtaining project services, that they viewed buy-in arrangements as cumbersome and time consuming, and that the process added an extra level of administrative detail. Moreover, some Missions viewed CTTA as inflexible, because it initially focussed on basic grains rather than other areas such as dairy production or horticultural crops.

At the outset, to individuals and Missions unfamiliar with the full scope of CTTA, the term communication in the project title may have signalled a conventional type of communications add-on to other projects, rather than indicating the overarching process of participatory technology transfer that CTTA offers. Project ownership also proved to be a problem, that is, were pilot activities guided by Mission or A.I.D./Washington oversight? Some Mission personnel appeared to view CTTA as a project directed from the central bureau and, therefore, did not take ownership of such projects. They accepted them as a potential source of funding. Furthermore, in several instances, past experience by Missions with public-sector extension had not met with resounding success. Hence, they were reluctant to continue investing program resources in extension.

Nevertheless, in countries where CTTA did take root, the Missions appreciated its commitment and involvement to bolstering agricultural communications and technology transfer activities. For example, the Director of the Office of Agriculture and Rural Development in the Honduras Mission wrote:

> *We take this opportunity to indicate the success this project has achieved in Honduras. Prior to the existence of CTTA, a systematic approach to extension which actively involved farmers in technology transfer was unknown. A department of communications within the Ministry of Natural Resources had been created, but worked with no direction and guidance until the CTTA pilot project was implemented.*
>
> *Supported by USAID/Honduras program funds for the last year of work, CTTA has now been operational long enough to become institutionalized within the Ministry. AED's team of experts, under the capable and enthusiastic direction of Dr. Milton Muñoz, has made a significant and valuable contribution to improved extension methodologies in this country. Not only this, but the Department of Agricultural Communications has become recognized as a critical and integral component of Ministry operations.*
>
> *USAID/Honduras has been fully supportive of the CTTA pilot effort in Honduras and congratulates the Academy for the manner in which the project has been carried out.*

## REFLECTIONS ON PROJECT EXPERIENCES

CTTA may have begun as a media effort, but it became something much more -- an integrated research and extension system for farmers. Several evaluations found that the project succeeded in developing a systematic technology transfer process that,

- is highly sensitive to farmers' felt needs;
- integrates extensionists, researchers, farmers, and communicators;
- provides for a high degree of farmer participation;
- uses existing personnel and resources in an orderly and cost-efficient manner;
- inspires a high level of motivation and enthusiasm among all participants; and
- is institutionally sustainable.

That CTTA's approach to technology transfer became broadly institutionalized in Honduras and Peru is testimony that host country authorities became aware of its importance and value. Equally significant is the fact that development staff in a country such as Nicaragua are eager to receive additional technical assistance in the use of the CTTA methodology. This indicates its flexibility and attractiveness to other developing countries.

CTTA's credibility and utility as an alternative to conventional agricultural technology transfer models was well-stated by the technical director of INIAA, the CTTA counterpart institution in Peru.

> *INIAA's experience was that under T&V (Training and Visit) methods, only 5-10 percent of farmers could be reached directly, but with CTTA you can reach 30-50 percent.*

For many national extension service personnel, CTTA instilled a new sense of purpose and direction. One extension station head said:

> *We already had a radio program, and we were already producing pamphlets. Nonetheless, the CTTA project gave us a new starting point by insisting upon a knowledge of the users [of the information -- that is, the farmers] and upon the importance of feedback from those users. We no longer just throw things out for no particular reason. Rather, we now go into the countryside to gather evidence. In addition, we articulate and synchronize the various communication media. With CTTA, we now develop a schedule for message delivery on the basis of the crop cycle.*

As result of CTTA Project activities, national extension services in countries where it was

implemented now have more well-trained technicians who will be able to continue using the CTTA methodology to train new personnel and students. CTTA has also strengthened host country capacity to disseminate agricultural research results to more farmers -- both men and women -- through the use of appropriate communication technologies based on a combination of individual, group, and mass media.

## Lessons Learned

Unquestionably, the experiences of CTTA during its long- and short-term activities have taught development practitioners to recognize that changing age-old traditions and agricultural practices of farmers is a process, rather than a quick-fix. Sustaining newly introduced behaviors or the use of new agricultural technologies and practices demands that the farmer's viewpoint and voice be heard. Moreover, messages disseminated to farmers must be clear, concise, and easy to follow. Equally important, CTTA has taught us to realize that all farmers are different, and that no medium -- whether radio, print, or interpersonal -- is an automatically effective communication channel for bringing about lasting changes. However, used in concert, and based on farmer preferences, interests, and characteristics, these media can be key tools in any national technology transfer campaign.

Although CTTA's emphasis was to work with public sector extension services that assisted subsistence farmers, its methodology, with minor modifications, can be readily adopted by private extension services to serve commercial farmers. The cumulative experiences gained during the seven years of CTTA have yielded a bounty of lessons that can contribute substantively to future technology transfer efforts.

## Using Social Marketing in Agriculture

**Agriculture is an extremely complex environment in which to attempt to apply social marketing principles.** The scientific environment for change in much social marketing work to date has been the human body. This is true for child survival, population, and nutrition. The human body is a closed system about which certain factual data remain the same among different cultures and over time.

In contrast, farming is an open environment in which the constant interaction of unpredictable variables makes analysis much less reliable. For instance, the natural resource base, soil, water, and sun, may vary considerably and unpredictably among farmers in a small community and in different countries and areas of the world. Such microclimates make generalization difficult and development of products and processes which can serve large numbers of farmers equally well nearly impossible.

**CTTA's experience has been that using mass media to market ideas to small farmers is difficult. Their circumstances vary and they sometimes lack access to media and other sources of**

**information.** Where a definite product can be defined (such as insecticides, fertilizer, or seed) or practices related to such products need to be highly uniform despite environmental differences (such as pesticide handling and storage), then media can be used to simultaneously reach and inform large numbers of farmers. Otherwise, communication media must be targeted and its content tailored to the farmers' context if it is to have reliable impact on farmer knowledge, attitudes, and practices.

**Social marketing works best when there are basic messages which can be repeated consistently, over time, to a targeted audience.** With farmers in CTTA, information about crop diseases lent itself to this approach more than time-sensitive information such as market reports. Even in crop disease situations, however, it is important to monitor farmers for continuous feedback and to adapt messages as circumstances change. Farmers' knowledge and experience in fighting disease is dynamic. Off-the-shelf recommendations often do not reflect the indigenous expertise that needs to be incorporated in programming.

**To date, social marketing's emphasis on the consumer or end-user has positively influenced CTTA.** This emphasis, coupled with behavioral analysis and motivational strategies, has allowed CTTA in many instances to become an effective conduit between farmers, research, and extension. CTTA's emphasis on consumers has made it effective in encouraging agricultural change. Two-way communication has served the institutions and professional staffs and gives voice to the farmer and his or her concerns.

## Technical issues

Spreading the benefits of improved agricultural methods to large numbers of farmers is one of the great challenges of social and economic development. Following are some key findings of the CTTA Project.

**Recommendations made through mass media must be simple and include very few steps.** Recommending only a few changes of practice at one time and in a logical, step-by-step process helps farmers apply them without confusion.

**Identify and segment audiences to clarify problems.** Farmers must be full participants if any technology transfer initiative is to be successful. It must be recognized that not all individuals can be reached or served through a particular medium. Hence, an integrated, multiple-channel strategy that reinforces messages will prove to be most effective in disseminating information to farmers.

**Problems must be defined in terms of client interests, thus allowing key audiences to become stakeholders in the process. Strengthen links between farmers, extension, and research.**

**The smallest budget can provide for some baseline and measurement of progress.**

**CTTA demonstrated that technology transfer efforts need not rely on external inputs to be successful.**

**Empowering extension workers by identifying people as their first priority and giving them tools to work with will lead to project success.**

**Flexibility is crucial to success.** CTTA can start in mid-stream and refine its transfer activities as it evolves. CTTA demonstrated that it can successfully adapt and improve -- rather than fully replace -- existing technology transfer models employed by host country governments.

**A process such as CTTA must be marketed around compelling issues.**

**Avoid giving too much information at once.** For best results, use multiple media for cost effectiveness.

**Research and extension need help to identify their underlying assumptions about farmers and other key clients.**

**Translate concepts and terms into language and images that clients can relate to, understand, and follow.** Build on indigenous knowledge and preferences. Focus extension efforts on modifying simple farmer behavior.

**Media selection should be based on the strengths and weaknesses of each medium, and upon the messages it will best convey.**

Research issues

**Better integration of program and research is needed should the CTTA methodology be applied in a non-experimental setting.** Based on the original plan and given the experimental nature of the CTTA Project, formative and summative evaluations served different purposes, had different audiences, and employed different research methodologies. These distinctions were not always understood in the field, where a division between research and program activities seems inappropriate.

**If a survey methodology is believed to be best suited to generate the information needed to design a communication strategy, a single survey should be conducted at the beginning of the project.** Such a survey should generate information that is useful for both planning and evaluation. Follow-up studies that may be carried out as part of a panel design requiring several measurements of the same sample over time may use sections of instruments used in the planning stages of the communication strategy. Duplication of efforts must be avoided.

**In conducting farmer impact research, choices need to be made about the crops, messages, and**

**practices that need to be followed-up.** Choices to be made should be based on the principal subject of the communication program. For example, if a communications program supports five different crops and all phases of production, it is important to identify the priority crops, production phases, and farming practices. Any impact evaluation should be limited to those priorities.

**Design of an impact evaluation of a communication program similar to that of CTTA should be based on theories of behavior change and models that can help predict relationships between exposure, knowledge, beliefs, and practices.** Using these theories in the planning stages of the research should help decide and limit the content of impact evaluation efforts.

### Project management issues

**Future projects such as CTTA that are funded by different A.I.D./Washington offices and Missions require thoughtful and clear delineation of roles and responsibilities for effective and efficient implementation of project activities.**

## Considerations for Future A.I.D. Technology Transfer Initiatives

In an era of changing agricultural directives by A.I.D. and other international donor organizations, it is essential that the lessons learned through projects such as CTTA not be forgotten or discarded. Proven approaches such as CTTA's must remain viable, visible, and available to all interested practitioners and institutions. A.I.D. should take steps to continue disseminating and promoting innovative means of transferring low-cost, appropriate, and simple agricultural technologies to farmers throughout developing countries. Efforts should be made to build on the advances made by the CTTA Project, as demonstrated in different locations around the world.

# ANNEX A
# COMMUNICATION FOR TECHNOLOGY TRANSFER IN AGRICULTURE PROJECT DIDACTIC MATERIALS, REPORTS, AND OTHER PUBLICATIONS

## HONDURAS

### Didactic Materials

*Preparación de Suelos para Siembra de Frijol en Ladera*, Secretaría de Recursos Naturales, Departamento de Comunicación Agropecuaria, Proyecto CTTA, Comayagua, 1987.

*Variedades de Frijol Recomendadas para la Zona de San Jerónimo*, Secretaría de Recursos Naturales, Departamento de Comunicación Agropecuaria, Proyecto CTTA, Comayagua, 1987.

*Variedades de Frijol Recomendadas para la Zona de San Luis*, Secretaría de Recursos Naturales, Departamento de Comunicación Agropecuaria, Proyecto CTTA, Comayagua, 1987.

*Variedades de Frijol Recomendadas para la Zona de El Rosario*, Secretaría de Recursos Naturales, Departamento de Comunicación Agropecuaria, Proyecto CTTA, Comayagua, 1987.

*Prevención y Control de Malezas*, Secretaría de Recursos Naturales, Departamento de Comunicación Agropecuaria, Proyecto CTTA, Comayagua, 1987.

*Prevención y Control de la Babosa*, Secretaría de Recursos Naturales, Departamento de Comunicación Agropecuaria, Proyecto CTTA, Comayagua, 1987.

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*An Examination of the Evaluation Process*, in Development Communication Report 1987/3, S. Hussein, 1987.
*New Communication - Technology Transfer Project Underway in Honduras and Peru*, in Cornell University IA Newsletter Vol. 3, W. Ward, Winter 1987.
*Bottom Up Training for Sustainable Change in Honduras, Development Communication Report,* Gail McClure, No.66, 1989/3.
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*CTTA Linkages with National and International Agricultural Research*, H. Ray, J. Axtell, D. Porter, 1986, Home Office.
*Project Overview: The Conceptual Basis*, H. Ray, W. Smith, R. Greenberg, September 1986 (DRAFT), Home Office.
*Reflexiones Sobre el Proceso de Generación y Transferencia de Tecnología en la Secretaría de Recursos Naturales*, M. Muñoz, December 1987, in Spanish, Honduras.
*Identification and Prioritization of Production Systems with the Participation of Farmers*, M. Muñoz, July 1988, Honduras.
*Uso y Preferencia de Medios de Comunicación por Parte de los Agricultores de la Zona de El Rosario*, Comayagua, L. Fuentes, 1989, in Spanish, Honduras.

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*The Potential Role of Farmer Organizations in Increasing the Productivity and Income-Earning Capability of Small-Farmer Agricultural Systems in the Developing Countries: A Concept Paper*, K.J. Byrnes, December 1985.
*The Agricultural Communication Process*, H. Ray, J. Axtell, D. Porter, 1986.
A Concept Paper. K.J. Byrnes, December 1985.
*The Application of Behavioral Analysis to Agricultural Technology Transfer*, H. Ray, J. Axtell, D. Porter,



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*Using Farmer Organizations to Support Communication for Technology Transfer in Agriculture*, by Kerry J. Byrnes, 21 March 1986.

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*Summative Evaluation Reports for Corn Cultivation, Rice Cultivation and Soil Conservation in Honduras*, Orlando Hernández, Dennis Foote and Shakir Hussein, Honduras, October 1990.
*Summative Evaluation/Honduras Longitudinal Investigation Data Analysis Plan*, O. Hernández and Dennis Foote, May 1990, Honduras.
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*Summative Evaluation Plan: CTTA Jordan*, S. Hussein, 1988, Jordan.

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*Honduras (MNR/FHIA) Letter of Understanding*, November 1985, in English and Spanish.
*Perú Letter of Understanding*, May 1986, in English and Spanish.
*Jordan Letter of Understanding*, September 1987.

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*CTTA/Honduras Integrated Action Plan*, 1988 - 1989, in Spanish and English.
*CTTA Honduras Integrated Action Plan*, 1989 - 1990, in Spanish and English.
*FHIA/Honduras Integrated Action Plan*, February 1987.
*SFCD 497-0304: Life of Project Plans: 1989/90*, USAID/DGFCA, February 1989, in English and Bahasa Indonesia.
*Jordan Integrated Action Plan*, December 1987 (DRAFT).
*Perú Integrated Action Plan*, May 1987, in Spanish and English, [unedited].

**Documentation/Diffusion Updates**

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*CTTA Documentation and Diffusion Plan*, April 1986
*CTTA Documentation and Diffusion Plan*, October 1987
*CTTA Documentation and Diffusion Plan*, July 1989

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*Honduras (MNR/FHIA Implementation Plan*, October 1985 (DRAFT)
*Swaziland Implementation Plan*, November 1985
*Malawi Implementation Plan*, February 1986
*Perú Implementation Plan*, March 1986, in English and Spanish
*Indonesia Implementation Plan*, May 1987 (DRAFT)
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September 1985/March 1986
April/September 1986
October 1986/March 1987
April/September 1987
October 1987/March 1988
April/September 1988
October 1988/March 1989
April/September 1989
October 1989/March 1990
April/September 1990
October1990/March 1991
April 1991/September 1991
October 1991/March 1992

**Semi-Annual Management Reports**

September 1985/March 1986
April/September 1986
October 1986/March 1987
April/September 1987
October 1987/March 1988
April/September 1988 (missing due to transition in management)
October 1988/March 1989
April/September 1989
October 1989/March 1990
April/September 1990
October1990/March 1991
April 1991/September 1991
October 1991/March 1992

**Newsbriefs**

**Honduras**

Comayagua - October 4, 1988
Choloma -November 10, 1988
Zamorano - April 20, 1989
Comayagua - May 4, 1989
La Esperanza - May 18, 1989
Comayagua - February 26, 1990
Tegucigalpa - March 12, 1990
Comayagua - April 16, 1990
Siguatepeque - April 23, 1990
Comayagua - June 18, 1990
Tegucigalpa - July 2, 1990
Comayagua - July 30, 1990
Comayagua - August 6, 1990



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**Indonesia**

Malang - August 12, 1988
Jakarta - October 21, 1988
Jakarta - January 25, 1989
Malang - April 6, 1989
Malang - April 13, 1989
Malang - March 5, 1990
Jakarta - March 26, 1990
Malang - April 9, 1990
Malang - May 14, 1990
Malang - August 13, 1990

**Jordan**

Amman - September 2, 1988
Jordan Valley - September 23, 1988
Amman - October 31, 1988

**Perú**

Huaraz - August 18, 1988
Huaraz - August 4, 1988
Huaraz - July 22, 1988
Puno - December 1, 1988
Chiclayo - February 8, 1989
Huaraz - February 15, 1989
Huaraz - February 1, 1989
Copa Chico - April 27, 1989
Copa Chico - May 11, 1989
Lima - April 30, 1990
Huaraz - June 4, 1990
Huaraz - June 11, 1990
Lima - July 9, 1990
Lima - July 16, 1990
Lima - July 23, 1990



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# ANNEX B
# COMMUNICATION FOR TECHNOLOGY TRANSFER IN AGRICULTURE PROJECT PERSONNEL 1985-1992

## ACADEMY FOR EDUCATIONAL DEVELOPMENT

### Home Office, 1985-1992

| | |
|---|---|
| Richard Bossi | Project Director, 1992; Deputy Project Director, 1991-1992; Project Associate, 1989-1990 |
| Gordon Appleby | Project Director, 1990-1992; Senior Project Officer, 1989-1990; |
| Gail McClure | Project Director, 1988-1990 |
| Howard Ray | Project Director, 1985-1988 |
| Edwin Tout | Associate Project Director, 1986-1990 |
| Susan Saunders | Associate Project Director, 1985-1987 |
| Orlando Hernandez | Evaluation Specialist, 1989-1990 |
| Barbara Roszel | Business and Logistics Manager, 1987-1990 |
| John Lipman | Business and Logistics Manager, 1990-1991 |
| Joan Parker | CTTA Program Associate, 1985-1986 |
| Kathryn Byrnes | Project Secretary, Business and Logistics Manager, 1986-1988 |

### Honduras, 1986-1990

| | |
|---|---|
| Valerie Barzetti | Interim Field Advisor, 1986-1987 |
| Milton Muñoz | Field Director, 1987-1990 |

<u>Short-term Technical Assistance</u>

| | |
|---|---|
| Jaime Carrera | Agricultural technology/communication, 1986 |
| Kerry Byrnes | CTTA Honduras Implementation Plan, 1985; Citrus Growers Study, 1986 |
| Bette Booth | Developmental investigation/communication strategy, 1986 & 1987 |
| Amalia Alberti | WID specialist/anthropologist, 1989 & 1990 |
| Michael Martin | Agricultural Economist, 1990 |
| Bernardo Humado Peña | Extension & Communication Specialist, 1989-1990 |
| Gordon Appleby | Project management advisor, 1989 |
| John Elder | Behavioral analysis, 1986 |
| Douglas Porter | Behavioral analysis/training extension strategy development, 1986 |
| Walter Correa | Assessment of graphic arts production, 1986 |
| Jorge Sarmiento | Agronomist |

### Perú, 1986-1990

| | |
|---|---|
| Jose Ignacio Mata | Field Director, 1986-1990 |
| Martha Cruz de Yanes | Social Research Specialist, 1986-1990 |

Short-term Technical Assistance

| | |
|---|---|
| Jose Luis Monterroso | Agricultural Technology Identification, 1986 |

**Jordan, 1987-1989**

| | |
|---|---|
| Darryl Kuhnle | Field Director, 1987-1989 |

Short-term Technical Assistance

| | |
|---|---|
| Eric Abbott | CTTA Feasibility Study, 1987; Project Implementation Plan, 1987 |
| George Abawi | CTTA Feasibility Study, 1987 |
| John Woods | CTTA Feasibility Study, 1987 |
| Scott Fedale | Audiovisual Communication Specialist, 1988 |
| Shakir Hussein | Baseline data collection for summative evaluation, 1988 |

**Indonesia, 1988-1990**

| | |
|---|---|
| E. Edward McKinnon | Chief of Party, 1988-1990 |
| David Brown | Senior Economist, 1988-1990, and Chief of Party, 1988-1988 |
| Klaus Altemeier | Econometrician/Marketing Specialist, 1988-1990 |
| Brian Hilton | Agronomist/Communicator, 1989-1990 |
| James Mangan | Senior Ag. Communication Advisor, 1988-1990 |

Short-term Technical Assistance

| | |
|---|---|
| Daniel Ajamiseba | Training Needs Assessment, 1989 |
| Peter Croke | Farm Credit Survey, 1989 |
| Barbara Martin-Schiller | Farm Family Survey/Communications Training, 1988 & 1989 |
| Paul Singleton | Biological Nitrogen Fixation Survey, 1989 |
| Hokey Siregar | Food Crops Marketing Systems, 1989-1990 |
| Gerald Williams | Soil Conservation and Farming Systems, 1989 |
| Willard Shaw | Pilot Project Communication Plan Development, 1988 |

**Ecuador**

| | |
|---|---|
| Kerry Byrnes | Farmer Organizations/Constraints to Technology Transfer |
| Eric Abbott | Extension Study |

**Senegal and Niger, 1987-1988**

| | |
|---|---|
| Robert Brandstetter | Rural Sociologist, 1987-1988 |
| David Miller | Extension and Communication Specialist, 1987-1988 |
| R. Kent Crookston | Agronomist, 1987-1988 |
| Constance McCorkle | Rural Sociologist, 1988 |

**ROCAP Agricultural Technology Transfer Conference**

| | |
|---|---|
| Gertrude Brekelbaum | Prepare for, facilitate, and draw conclusions from a Steering Committee, 1988 |
| Howard Ray | Prepare for, facilitate, and draw conclusions from a Steering Committee, 1988 |

**Nicaragua, 1991 & 1992**

| | |
|---|---|
| Richard Bossi | Team Leader, 1991; Training Workshop Coordinator, 1992 |
| Jose Ignacio Mata | Technology Transfer Specialist, 1991; Lead Trainer, 1992 |
| Martha Cruz de Yanes | Trainer, 1992 |

**Bolivia, 1990**

| | |
|---|---|
| Gordon Appleby | Development Institutions Specialist |
| Phillip Easton | Development Economist |

**Portugal, 1991**

| | |
|---|---|
| Gordon Appleby | Institutional Development Specialist & Team Leader |
| Jose Ignacio Mata | Technology Transfer and Communication Specialist |

**Sahel, 1991**

| | |
|---|---|
| Gordon Appleby | Institutional Development Specialist |
| James Kelley | Team Leader |

**APPLIED COMMUNICATION TECHNOLOGY, INC., 1986-1990**

| | |
|---|---|
| Dennis Foote | President & CTTA Associate Director for Evaluation |
| Shakir Hussein | Research Associate |
| Judith McDivitt | Research Associate |
| Susan Stone | Administrative Officer |
| Martha Cruz de Yanes | Social Scientist/Evaluation Specialist, Peru |
| Orlando Hernandez | Evaluation Specialist, Honduras |

**CORNELL UNIVERSITY, 1985-1988**

| | |
|---|---|
| Larry Zuidema | International Agriculture Programs, CTTA Administrative Coordinator |
| Royal Colle | Department of Communication Arts, Temporary Technical Coordinator |
| Willima Ward | Technical Coordinator |
| David Thurston | Technical Coordinator for FHIA activities |
| Jeff Curtis | Project Administration |



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**FHIA, 1985-1988**

| | |
|---|---|
| William Ward | Ag. Communication Specialist, Development Prospectus |
| G. Christopher Millensted | Advisor |
| Jairo Cano | Long-term Communication Advisor |
| Gerald McCart | Implementation Plan, 1985 |
| James Miller | FHIA Facilities Plan, 1985 |
| Gary Hermance | FHIA Equipment List, 1985-1986 |
| Edward Williams | Fundraising Materials, 1986 |
| Cristina Kessler | FHIA Communications and Development Units, 1986 |
| Charles McCulloch | FHIA Computerization, 1988 |
| David Thurston | Scientific Networking |
| Victor Porras | Scientific Publication, 1988 |
| Chris Pelkie | FHIA Computerization, 1987 & 1988 |
| Howard Curtis | FHIA Library, 1988 |
| Jaime Carrera | Training Workshop, 1986 |

AGENCY FOR INTERNATIONAL DEVELOPMENT

**Bureau for Science and Technology (Bureau for Research and Development)**

**Office of Education**

Anthony Meyer (CTO)
Clifford Block (CTO)

**Office of Rural Development (Office for Economic and Institutional Development)**

Larry Abel (CTO)
Terry Hardt (CTO)
Chloe O'Gara (CTO)
Kenneth Swanberg
Michael Yates (CTO)
John Grayzel

**Office of Agriculture**

Wendell Morse
Raymond Meyer
Roberto Castro
Chung Chi Lu

**Advisory Panel**

Stephen Wingert, LAC/DR
Kenneth Prussner, AFR/TR/ARD
D. Pickett, ANE/TR
J. Atherton, PPC/PDPR

## USAID MISSIONS

### USAID/Honduras

Blair Cooper
Richard Owens
Gordon Straub

### USAID/Peru

David Bathrick
Timothy Miller
Joseph Salvo
Audon Trujillo

### USAID/Jordan

Randy Cummings

### USAID/Indonesia

Richard Cobb
William Douglass
Joanne Hale

### Other USAIDs

Darryl McIntyre, USAID/Quito
P. Daly, USAID/Mbabane
M. Baker, USAID/Lilongwe

## CTTA Project Technical Advisory Board

| | |
|---|---|
| John Axtell | Purdue University |
| Donald Esslinger | University of Missouri |
| Douglas Porter | Harvard University and Beth Israel Hospital |
| Robert Porter | Porter/Novelli |
| William Ward | Cornell University |
| Robert Hornik | Annenberg School of Communication/U. Pennslyvania |
| Paul Touchette | University of California, Irvine |
| Delane Welsch | University of Minnesota |

## Collaborating Institutions

| | |
|---|---|
| Eric Abbott | Iowa State University |
| Marion Brown | University of Wisconsin |
| Charles Whyte | Virginia State University |
| Robert Porter | Porter/Novelli |