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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

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9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 77; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 78

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 -)

A. FUNDING SOURCE	FIRST FY B. FX	C. L/C	D. TOTAL	LIFE OF PROJECT E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL	85		85	230		230
(GRANT)	(85)	( )	(85)	(230)	( )	(230)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY						
OTHER DONOR(S)						
TOTALS	85		85	230		230

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	D. LOAN	E. 1ST FY 77 F. GRANT	G. LOAN	H. 2ND FY 78 I. GRANT	J. LOAN	K. 3RD FY ___ L. GRANT	M. LOAN
(1) FN	191	010		85		145			
(2)									
(3)									
(4)									
TOTALS				85		145			

A. APPROPRIATION	N. 4TH FY ___ O. GRANT	P. LOAN	Q. 5TH FY ___ R. GRANT	S. LOAN	LIFE OF PROJECT T. GRANT	U. LOAN
(1)					230	
(2)						
(3)						
(4)						
TOTALS					230	

12. IN-DEPTH EVALUATION SCHEDULED: MM YY

13. DATA CHANGE NOTICE (DCN) WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 21? IF YES, ATTACH CHANGED PID FACESHEET. [ ] 1 NO 2 YES

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE

DATE SIGNED: MM DD YY

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS DATE OF DISTRIBUTION: MM DD YY

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Project Paper - CGIAR Data Communications Engineering

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Part I. Project Summary and Recommendation

A. Recommendation

Grant FY 77 - $85,000; FY 78 - $145,000

B. Description of the Project

This is a project to study the feasibility of a low cost data communications system for the eleven CGIAR International Agricultural Research Centers located in the developing countries. This would be essentially an electronic mail system. The new system would enable the centers to replace their present slow and inadequate communications with daily service, thereby giving their staffs speedier and more reliable access to research data and professional colleagues elsewhere. As well as permitting exchanges between centers on subjects of common interest such as pest control, it would facilitate contacts between applied researchers at the centers and basic researchers in developed countries on subjects such as nitrogen fixation and photosynthesis that are fundamental to improved agriculture. The system would improve the centers' management by expediting the handling of budget, personnel and administrative matters.

Another, equally important, purpose is to enable study of the resulting system as a possible prototype for communications systems in other development activities (e.g., health, population, rural development), which, also located in the LDC's, have similar communications problems. This project will be pioneering the trial of a data system, which, while using up-to-the-minute, developed technology, is nonetheless appropriate to less developed country needs.

During the feasibility study, a contractor will develop an engineering design of a proposed communications system. The study and design constitute Phase I of the project. Costs of this phase are estimated at $85,000.

If the study proves the feasibility of a telephone polling system, and the Federal Communications Commission has authorized international use of telephone service for data transmission, the project will proceed into Phase II. This phase will consist of six months' actual trials of a 12-node telephone polling system for the agricultural research centers. Costs of Phase II are estimated at $145,000.

When the trials have proved the system's operating feasibility, the centers or the Consultative Group on International Agricultural Research (CGIAR) will consider its financing as a continuing system.

C. Summary Findings

Technical questions about the feasibility of transmitting data to remote LDC locations over telephone lines appear solvable by use of appropriate equipment. The problem of equipment maintenance has been reduced by appearance on the market of increasingly higher-reliability computers and terminals, and by interchange of components - which can be done by relatively unskilled personnel. While there is an absence of satisfactory data - which this project is intended to produce, indications are that the benefits of improved communications will more than justify the projected cost. As has been indicated, the project is aimed at a low cost system. Moreover, the several telecommunications organizations with which we have talked believe that a system of the nature proposed is feasible at a reasonably low cost for, at least, most of the international agricultural research centers.

D. Issues

In addition to the primary issue of technical and economic feasibility, there are the following issues to be considered:

(1) Will this study help to determine the value of various kinds of communications for LDC development? The subject of study is appropriate modern communications. A system of the type proposed would be usable for electronic mail purposes by regular telephone service within countries and regions as well as internationally. Such data communications systems are not in use for overseas development. Also, because of the continuing developments in communication and the changes they are bringing about, we believe it important to study these matters so that A.I.D. and the LDC's don't fall behind.

(2) The question of whether or not the study project (Phase I) can move directly into the field trials (Phase II) depends on final FCC action to authorize international data transmission by regular telephone service. As indicated under Special Conditions, page 20, the FCC has not finally authorized the transmission of data over international telephone circuits although it has decided in principle to do so. Authorization is expected, but we cannot say when action will be completed. We will follow FCC progress on this matter. Should telephone data transmission not be authorized by the conclusion of Phase I, the trials and the ultimate system implementation would be deferred or based in a country - other than the U.S. - where the telephone data service is available.

(3) In response to the PID for this project—which was very similar in approach and content to this project paper—the Latin America Bureau said that there is no proven support to show that improved communications will enable the Centers better to assist food production and improve the income of rural populations. Based on the information in the project paper, we believe that improvement of their present poor communications should enable more effective research and administrative management, and that these will lead to improvements in agriculture.

The Bureau also said that AID's financing of the project runs counter to the objective of increasing international financing and support of the CGIAR. The Office of Engineering also felt that the project should include financing from other donors. The reasons for A.I.D. financing are given on pages 8-9. We believe that this project has elements of particular interest to A.I.D., and that demonstrating the system will, in fact, increase the likelihood of international financial support.

Other comments and suggestions were received on the PID. These have been taken into account in this paper and will continue to be taken into account in project implementation. A total of four responses to the PID were received—three from regional bureaus and one from the Office of Engineering. All but the regional bureau referred to supported the project.

Part 2. Project Background and Detailed Description

A. Background

In 1975 M.I.T. studied the communications needs of the CGIAR International Agricultural Research Centers. The study was completed in January 1976.

M.I.T. found that the Centers used telecommunications mainly for administrative purposes. Communication on research matters is done almost entirely by personal travel or use of the mails. Research personnel would like to communicate with more speed and reliability but present alternatives are so far out of reach that they have given little thought to the communications problem.

M.I.T. said that the Centers' communications needs are acute. They have cooperative experiments with other institutions. They have outreach and educational programs. They need current weather and crop information,

and to know the availability of genetic strains. Their libraries need to be in touch; their equipment requires maintenance and spare parts. They need better communications to improve the handling of budget, managerial and personnel matters.

As an optimum means of improving the Centers' communication M.I.T. suggested a low-cost telephone polling system. This would enable transfer of messages and data among the eleven international centers located in various parts of the world, certain other agricultural research centers, the World Bank and A.I.D. M.I.T. estimated the yearly cost of a polling system at under $150,000.

M.I.T. recommended that, as a next step, an on-site engineering study be made at each node of a proposed 16 node system. M.I.T. added that a telecommunications pilot project for the International Agricultural Research Centers would be useful, not only for its contribution to the agricultural centers, but also as a basis for studying more extensive LDC uses of the systems tested. It would provide a test of what's possible in an LDC environment, and permit measurement of difficulties, costs and maintenance needs.

In July 1976, M.I.T. presented its findings and recommendations at a meeting of the Center Directors in Washington. The Directors, in turn, recommended to the CGIAR that an engineering study, be carried out. In response to a request from the Directors, the Technical Assistance Bureau, in September 1976, advised Dr. Nyle Brady, Director of the International Rice Research Institute in Manila, that we would move ahead on the planning of a combined feasibility and engineering study. Planning for that study has now been completed and approval of this paper will enable its implementation.

B. Detailed Description

(1) Goals

(a) The goal of this project is to improve agricultural research by improving the flow and exchange of technical information among the CGIAR International Agricultural Research Centers and with other research institutions.

Its philosophy is simply that increased and improved world food production is of high priority, that agricultural research is an essential part of the job, that research depends heavily on the ability of researchers to communicate with colleagues working in related areas,

and that improving the presently poor communications of the international agricultural research centers will improve their research and, in turn, the world food supply.

(b) The other main goal concerns making better use of modern communications in programs and projects in other fields of LDC development. We expect to develop a simple, low-cost, communications system that can be used in research and other types of networks among institutions working in education, population, health and other areas.

(2) Purpose

The project's purpose is to develop an inexpensive data communications system which will provide reliable daily contact among the international agricultural research centers and their related institutions, and thus enable them to increase the present minimal flow and exchange of data and information.

The intended system is a telephone polling system. It will consist of a small, centrally-located, switching computer that will daily contact a computer terminal to be located at each of the system's nodes - receive their outgoing messages and transmit to them the messages it has received for them. The system will carry data and text only - not voice. Transmission will be over normal telephone lines, using normal telephone service for a few minutes per node per day. The preliminary M.I.T. study estimated the total yearly costs of a 16-node system at $137,000 a year, exclusive of local personnel costs.

The system is planned for 16 nodes. It will include as nodes all of the 11 International Agricultural Research Centers for which the system is feasible, plus other research institutions and organizations with whom the international centers are in frequent contact. For example, the centers deal frequently with their Technical Advisory Committee in Rome, with the CGIAR secretariat in Washington, with the International Institute of Education in New York which handles their procurement, and with certain universities and research institutes. Several of the latter institutions will be included in the international centers' immediate system. To communicate beyond the system, the centers will use present means of communications (regular mail, Telex, telephone), or will transmit their messages through the system to its hub for relay (by mail, Telex or telephone).

(3) Outputs

At the end of the project, in 1978, the CGIAR agricultural research centers should have a basic data communications system already in being. It will have received six months of testing under actual field conditions, with equipment and trained personnel in place, and the basic system in operation. Unlike many projects, it will need no major construction or implementation period after this initial study and engineering project since this project will create the system as it proceeds. It will instead require acceptance by the centers and CGIAR, determination of its future financing, possible refinement or expansion, and possibly an extended period of trials.

(a) The system would enable each node to transmit 75 pages of text each day, and receive an additional 75 pages. (This is based on an average cost of 6 minutes of telephone time per node per day. In fact, the volume sent would depend on the needs of each center, which would pay the costs out of its own budget.)

(b) Content of messages would be as sent over any communications system - including that usually sent by letter or cable, reports, studies, numerical data.

(c) The system would enable an indirect form of computer conferencing among centers and institutions on the system. This would be non-synchronous. For example, centers could establish a period of time during which papers, reports, or proposals on a designated subject could be circulated, exchanged, commented on, and actions determined.

(d) Assuming that the hub of the system will be staffed to provide relay service, the system

(1) can send messages on to points outside the system, and
(2) provide access to automated data banks - through connections at the hub.

(e) Once the system is established it should provide the impetus for development of a substantive research and administrative network among the centers and other institutions for regular exchange of personnel, materials and information. It should also demonstrate ways by which communications can be improved for outreach to regional and national research centers.

In addition to the primary output — the system itself, the contractor's report will provide other outputs usable for this system and for study for other development purposes, namely:

(a) data on volume and types of data flow among the research centers and to and from institutions and sources outside the network-present and projected;

(b) data on training and intermediary needs;

(c) an administrative plan, covering local personnel requirements, supplies and other local costs;

(d) an operational plan for message preparation, storage and handling at system nodes;

(e) projection of future communications needs (volume, types, kinds of services), and need for short and long-run addition of nodes to the system and connection points to international communications networks including costs, means and rationale therefor;

(f) a continuing evaluation plan for the system to include records of traffic on the system, study of types of uses made, efficiency, effectiveness, significance and behavioral experience.

(4) Inputs

(a) Phase I.
The key input to the project will be an A.I.D.-financed contract for approximately 6 months' services of a telecommunications engineering organization. The contractor will visit the agricultural research institutions, determine the feasibility of establishing a 24-hour electronic mail service among them, and design a system and plan of operations. In addition to its engineering capability, the communications organization should have, or be able to draw on, economic, managerial and legal talent. Total costs for this phase are estimated at $85,000.

(b) Phase II.
Provided that system feasibility has been established and the FCC has authorized international data transmission by telephone, the project will proceed to Phase II.

A new contract will be entered with a telecommunications organization to visit additional research and related institutions to determine the feasibility of adding them

to the system, and to conduct six months of trials of the resulting system. Total cost of Phase II, estimated at $145,000, will be financed under this contract, including equipment rentals and communications charges and a possible subcontract.

Equipment rental costs and communications charges for the 6 months system trials are estimated at $57,000. The computer, terminals and related equipment required are normally rented, rather than purchased. Communications charges will pay for daily telephone services, estimated at an average of six minutes a day for each of 12 nodes in the proposed trial network.

A subcontract may be required for monitoring, managing and maintaining the system. A few firms provide such services today to American corporations that use data communications systems. Such contractual services for consulting and for managing the system over its 6-months trial period are estimated at $12,000.

(5) A.I.D.'s Role

A.I.D. financing of this project is based on several considerations of particular interest to us.

The proposal for a CGIAR communications system arose out of the A.I.D.-sponsored M.I.T. communications study. In recent years A.I.D. has been contributing 20-25% of total CGIAR costs for the International Agricultural Research Centers. (A.I.D.'s share for 1977 is estimated at $18-19 million.)

The project is based on an A.I.D. initiative and is a one-time study well-suited to one-donor financing. Agricultural research is of priority to A.I.D. and improved communications between the international centers and U.S. research centers will benefit both. Communications exchanges between the international centers and U.S. universities will also grow as Title XII activities grow.

A.I.D. needs more experience to evaluate the place of communications in other sectors and programs. Various AID activities such as health delivery systems and education programs could be benefited by the introduction of simple, low-cost communications means into LDC environments.

This project offers an opportunity to try out appropriate technology, in this case, the using of advanced means for appropriate use in unadvanced environments. It is in keeping with the United States' continuing interest in improving means of information exchange and technology transfer. We also expect to be utilizing American private experience which is both the most experienced and perhaps the best-suited to the project needs.

A.I.D is conducting the study because neither the CGIAR secretariat in Washington nor the centers themselves are well-suited to contract for or administer the feasibility study. The secretariat has a small staff which does not perform coordinating functions; the centers are widely dispersed and without a central staff. It will be quicker, easier and less expensive for us to conduct the study than to negotiate multi-donor participation.

We are obtaining international support of the project by working with CGIAR and the centers in its development. When the A.I.D. study and experimental project is completed, the opportunity will come to obtain the financial participation of international donors. On completion of this project, the communications system will be presented to the CGIAR or the Centers with the expectation that funding of a continuing system will become the responsibility of interested donor members of the Group.

The proposed expenditure of $230,000 for the study and development project appears justified. The system will affect all aspects of the centers research work and thereby enhance our sizeable continuing investment in them.

Part 3. Project Analyses

A. Technical Analysis

This is a feasibility and design study of a telephone polling system. Subject to satisfactory determination of the feasibility of such a system, it will undergo six months of field trials.

It will be a star network, passing all messages and text through a central switching computer (likely to be located in the U.S.). Unlike the more expensive and complex "distributed" type of network, nodes on a star network cannot use the network for direct communication back and forth with each other.

Planning is based on a 16-node system. However, during the project period of study and trials participation will be limited to no more than 12 nodes, ten of which will be overseas.

Data transmission will be over normal telephone lines, using normal telephone service for a few minutes per node per day. The equipment presently envisaged is off-the-shelf equipment, available for rental at low cost. In the U.S., rental of a switching computer runs about $1000 a month; for each intelligent - that is, with a memory - computer terminal, about $200 a month.

Networks of this type are in commercial operation in the U.S. and are therefore known to be technically feasible in this country. However, they have not been tried out for serving a number of widely separated countries overseas.

There are three areas that, in the LDC environment, could present technical problems. One is the quality of telephone lines. The agricultural centers are located outside the main cities and some use rural lines for their connection to the international exchanges in the large cities. Rural lines may, in some cases, have characteristics that make data communications unreliable for remote computing. In such cases, it might be necessary to consider text transmission at low data rates, develop special equipment, or install a private direct line to the capital city or international exchange.

A second question to be solved is whether or not the polling system can use automatic switching, or whether it will need the services of an operator. Ideally, a polling system should use direct distance dialing, as U.S. polling systems do. Direct dialing enables the switching computer to dial the numbers being polled and permits an unmanned, simpler system. However, international direct distance dialing does not now exist for several of the countries being considered for the CGIAR network. Although the international direct dialing network is growing rapidly, it is likely to be some time before it becomes available to all nodes on the network. The contractor will be expected to determine the best means of overcoming this problem. One means is to employ a person to put a call through, then switch on the computer transmission. Another is to have the switching computer play a recorded message to the overseas operator.

The third technical question is maintenance of telecommunications equipment overseas. Maintenance is a subject of constant complaint in the LDC's. However, computers considerably more complex than anything contemplated for this project are kept in operation. New terminals and other equipment with high reliability factors are coming onto the market. In some locations it may be desirable to have a duplicate machine on hand while the other is sent for repairs.

These are the main technical questions foreseen in establishing a polling system. One of the indications that effective telephone

connections can be worked out is the fact that during the earlier study M.I.T. tested available services by successfully making telephone contact with each of the international agricultural research centers and interviewing them.

A more complete view of the technical considerations involved in this project may be obtained by referring to Appendix A, a Draft Scope of Work which outlines the tasks that the project contractor will perform.

B. Financial Plan and Budget

1. Cost Estimate

Project costs, estimated at $229,600, are shown on the table which follows in this section. In short, costs are estimated on the basis of two phases: 6 months for study and design; and, later, 6 months for operational trials.

The project will be administered under two contracts. Its costs, by phases, are:

I.	Contract services for system study and design	$ 85,000
II.	-Contract services for conduct of field trials	75,600
	-Equipment rental and communications charges	57,000
	-Subcontractual services (managerial, maintenance and monitoring)	12,000
		$229,600

2. Validity of Cost Estimate and Technical Analysis

The project, by definition, is a feasibility study. As one which is looking into new techniques as yet untried under LDC conditions, the cost estimates and technical analysis have less than the usual experience to draw on.

The estimates and analysis are based, first, on the estimates and conclusions of the preliminary M.I.T. study; secondly, on a period of project development during which adaptation of U.S. telephone polling systems to LDC areas was discussed at length with telecommunications consultants and organizations familiar with such new systems. Of particular value in planning this project have been the services of Mr. Arthur B. Corte, co-director of the M.I.T. DATANET project which studied the communications needs of NASA, the Office of Telecommunications Policy, and the State Department, as well as A.I.D. Mr. Corte, a State Department Officer (who was detailed to M.I.T. for the DATANET project) has participated actively in the development of this project.

FINANCIAL PLAN

Salaries		Phase I		Phase II	Total
Project Manager $48,000 year - 12 man months		$20,000		$28,000	$48,000
Communications Specialist $32,000 year 6 man months		14,000		7,400	21,400
Short-term consultants (U.S. and overseas) $30,000 year (Avg.) 3 man months		3,500		4,000	7,500
Overhead @ 75%		28,100		29,600	57,700
Travel					
U.S.		2,000		1,000	3,000
International	(9 site visits)	8,000	(8 visits)	6,000	14,000
Local costs		1,000		1,000	2,000
Per Diem - @ $35	(120 days)	4,000	(90 days)	3,000	7,000
Equipment and related costs		3,000		30,000	33,000
Managerial, maintenance and monitoring services				12,000	12,000
Communications charges (6 months - 10 overseas nodes)		1,000		23,000*	24,000*

Total

Phase I	$84,600	
Phase II		$145,000*
Project		$229,600*

*Trials beyond 6 months would require additional funding.

The communications people with whom we have discussed the technical feasibility of a telephone system believe that it is feasible for most, if not all, of the international agricultural centers at a resonably low cost.

C. Social Analysis

As a study project, this project should not be expected to provide short-run direct benefits to individuals in the recipient countries.

However, as an improved communications system comes into being it should contribute indirectly to the well-being of individuals and communities as agricultural research is improved and contributes to the production of more and better food for all countries.

A low-cost activity, it should also contribute to lowering the cost of communications and stimulate development of other systems which will reach out into the countryside.

Also, there is a considerable body of thought that improved communications induce modernization and development as they break the hold of tradition and diffuse innovation.

Economic Analysis

The DATANET studies of M.I.T. which gave rise to this project were directed toward making overseas communications more economical. The hypothesis of the studies was that presently available technology could make possible global communications of data and text at costs comparable to present postage rates or local telephone service. The research that was done confirmed the hypothesis.

M.I.T. estimated yearly costs of a 16-node telephone polling system at $137,000. This would amount to an average yearly cost of $8600 a year for each center for a daily mail service permitting the transmission of 75 pages of text each day.

Yearly communications costs of the proposed system would represent but a small part of the information, library and documentation costs of the research centers even if the $137,000 M.I.T. estimate proves to be low. In 1975 the library and documentation costs of just the seven centers studied by M.I.T. came to $1,500,000.

Costs of alternative systems studied by M.I.T. were estimated much higher than those of a telephone polling system:

	Cost per year	Pages/per day/per node	Cents per page
Telephone polling	$137,000	75	$ .43
Telex - low usage	149,000	3.2	11.31
Telex - high usage	897,000	19	11.30
Leased teletype	897,000	316	.68

Other systems, such as use of leased voice/data circuits, could result in lower costs per page, but they require much higher expenditures at much higher volume than could be justified for the agricultural research centers.

If the system cost estimates resulting from the proposed study confirm, or are comparable to, those of M.I.T., the main economic question of this project becomes qualitative, rather than quantitative - will the system contribute to better agricultural centers, research and research applications? If, as anticipated, it will, the costs are very reasonable.

Also to be kept in mind are the general economic benefits expected to accrue to countries as communications systems are improved and expanded. It has been estimated that in the U.S. about 46% of our GNP goes for production, processing or distribution of information goods and services, and that over one-half of our total wage bill goes to this sector in which communications plays a major part. The proposed agricultural research communications system should lead the overseas centers into use of the U.S. and other data bank information systems. It should help their countries toward increasing use of improved communications in other fields, better technical information, and economic betterment.

D. Environmental Implications

This study project is expected to have no significant environmental impact. An Environmental Threshold Determination to that effect is attached as Appendix B.

Part 4. Implementation Arrangements

A. Phases

The project will be carried out in two phases: Phase I, will be a feasibility survey and design of a data communications system. Phase II, subject to AID determination of its feasibility, will be the conduct of operational trials of the system among several of the centers and related institutions.

A.I.D may terminate the study on completion of Phase I if, in the light of information obtained in that phase, it considers that Phase II is not justified.

B. Implementation Plan

(1) Prior to start of work under the contract, A.I.D. will reach agreement with the international agricultural research centers, directly or through the CGIAR secretariat, on administrative or operational matters, including:

(a) relationships and dealings with host governments,

(b) administration and backstopping of the project,

(c) relationships and cooperation between and among A.I.D., CGIAR, the centers and other institutions,

(d) and cooperation between the centers and contractor for providing the contractor access to information needed for the project and authorizing installation of necessary equipment.

(2) As Phase I, the engineering contractor will carry out the feasibility study and design of the system along the lines of the draft Scope of Work attached as Appendix A. The target date for contract signature is August 31. Assuming that the contractor begins work in late September, he will spend a month in the U.S. for study, consultation, testing of overseas services, determination of need for a subcontract and overall project planning.

(3) Beginning November 1, the contractor will make 9-10 site visits to proposed system nodes in Asia, Africa, Europe and Latin America. These visits will be accomplished by the two engineering contractor personnel (and short-time consultants, as necessary). His purposes will be to determine the nature of existing telephone services and facilities, and local regulations governing communications services. At the conclusion of 2 months of field investigations, he will return to the U.S. to complete his report, which will include recommendations on feasibility, system design and a plan for operational trials. Following receipt of his report, in mid-January, A.I.D. will consult with CGIAR, then make its decision on the system's feasibility.

(4) Phase II will begin March 15, unless the system has not proved feasible and FCC authorization of international data transmission by telephone has not been made — in which case the project ends here.

(5) In Phase II, the contractor will start field trials of the proposed system, expediting equipment delivery, and confirming earlier guidance and instructions to the agricultural research centers and nodes of the system.

(6) Beginning in March, the contractor will again make field visits - to 8 or more additional centers and main points of communications. On these visits to centers and points not previously visited he will carry out the same functions as in Phase I — to determine the feasibility of their becoming nodes in the system. The new points will be added as nodes to the system, and will progressively take part in the operational trials. During this period overseas the contractor may also revisit certain sites, if necessary, to solve problems, guide or check on progress of the trials.

(7) By the end of May, six or more nodes of the system should be operating a system on a trial basis. By the end of August (1978), up to 12 centers and related institutions should be participating in these test runs of a data communications system.

(8) If the system is determined to be feasible, A.I.D. will at an appropriate time present the contractor's report to CGIAR for consideration of adoption of the system by that body, and for financing the permanent system by its member states and institutions.

C. Organizational Relationships

(1) Host Governments

In this project which concerns international centers, A.I.D. will work primarily with the International Agricultural Research Centers and with the Washington secretariat of the Consultative Group on International Agricultural Research (CGIAR). A.I.D. should have few direct dealings with host country governments. However, in one important area, it will be necessary that the contractor and/or the centers get in touch with governmental Post, Telephone and Telegraph organizations (PTT's) to obtain authorization for the centers' use of data communications. Governments are traditionally very careful about authorizing use of international communications and some PTT's have restrictions on communications innovations. It is hoped that the governments where the international centers are located will

permit the use of data communications for these agricultural research purposes. The American Telephone and Telegraph Company (AT&T) has queried governments on their willingness to authorize data communications; as of February, 1977, 45 countries had responded to AT&T, and agreed to provide international data service. Included among them were four (Colombia, India, Peru and the Philippines) in which centers are located. Others had not responded.

(2) CGIAR

As indicated, we will be working with the centers and the CGIAR which has its secretariat at the World Bank in Washington. The CGIAR is composed of 29 international organizations, national and aid agencies, private foundations and others. Its total funding level, from all donors, was about $64.5 million for 1976. Each international agricultural research center has its own board of directors to whom it is accountable. There is no central budget for the centers as a whole. Individual donors contribute to individual centers.

A.I.D is consulting throughout the project with the CGIAR secretariat which has a small staff in Washington, and with the Directors of the centers. We are in the process of working out administrative and coordinating arrangements for the study with the CGIAR and the centers.

Ultimately, it may be necessary that the CGIAR provide an individual to handle the re-transmission of messages from nodes in the system to points - in the U.S. and elsewhere - not on the immediate system. Administrative requirements of this nature should be small and within CGIAR capacity.

(3) A.I.D.

The Technical Assistance Bureau, through TA/PPU/EUI, will provide the services of a project monitor. Because the project is experimental in nature, and because of the considerable amount of project development work that has been done, the project officer will be expected to brief the contractor in detail on project history and development, and to see that regular contact is maintained with him. Another significant responsibility will be to see that the CPI indicators, Appendix D, are on time and necessary action taken. These include selection of nodes, determining project backstopping, bringing about answers to the question of FCC authorization, monitoring feasibility, monitoring the scheduling of field trials and equipment delivery, and bringing about CGIAR action on future financing.

D. Contracts

(1) Engineering

The work will be carried out by direct A.I.D. contract with a telecommunications organization — a commercial firm, consulting firm or non-profit organization. The work involves a system new to the United States and untried in the developing areas. For this reason the primary criterion for selection must be that the contractor have extensive telecommunications experience, particularly in data communications. It is desirable that he have international experience. In addition to the main requirements for engineering and technical capabilities, the contractor will need to have, or be able to draw on, economic, managerial and legal experience to meet project needs for economic estimates, operational plans and the handling of legal and regulatory problems. The contractor will also be responsible for investigating rental (or purchase) of necessary project equipment.

Project planning is based on two contracts — one for each phase. Each would employ two persons. The project manager must have high-level communications experience, and should be acquainted with economic and legal/regulatory, as well as systems aspects of communications. The communications specialist must be highly qualified in computers and data communications. At least one of the contract personnel must have significant LDC telecommunications experience. The contractors would also be authorized to hire one or more short-term consultants (foreign or U.S.) for up to 90 days services during the two phase project.

Two contracts, each of 6 months duration, are planned. Anticipated signature date of the first contract is August 31, 1977.

(2) Managerial and Consulting Services

The engineering contractor may require continuing consultation with firms experienced in the management, equipment, servicing, and operations of telephone polling systems in the United States. The system may also require continuing monitoring and assistance in these functions during the operational trials and later, when it is permanently established.

One of the Phase I responsibilities of the engineering contractor will be to determine whether such services will be needed during the project. If so, he will recommend such services, through sub-contract or otherwise.

E. Equipment

(1) Little equipment is required for a polling system. The system requires (1) an intelligent computer terminal with a memory at each node, (2) a switching computer at the system's hub, and (3) a modem at each node. As has been noted, this is commercially available.

(2) However, should the contractor find that significant modifications of present equipment are necessary, such as special devices to compensate for poor quality of telephone lines, costs and schedules might have to be adjusted accordingly. Need for such changes would be considered as determined and would necessarily be taken into account prior to a decision to undertake Phase II of the project.

(3) Of particular importance is the need that the contractor determine the kinds and models of equipment required and delivery schedules as early as possible so that he can effect delivery of equipment to be on hand at the overseas and U.S. nodes in time to start the operational trials as scheduled.

(4) The contractor will also have to study the various terminals and minicomputers on the market to evaluate their maintainability for use in remote rural LDC areas.

(5) He will also determine whether equipment for the trials (and later continuing use) should be rented or purchased.

F. Evaluation Arrangments

(1) This project will require no special provisions for evaluation since, as a study and trial project, it is evaluative in nature. The data and information collected during the project by the contractor will be evaluated, in the first instance, when the feasibility decision is made, and, in the second, when decision is made on a permanent system. The contractor's reports (see PP. 5 and 8, draft Scope of Work, Appendix A) will serve as evaluative documents for determining the applicability of such systems for other development fields and uses.

(2) The contractor will, however, be required to prepare, and include in his reports, a continuing monitoring and evaluation plan for use when the permanent communications system comes into being. It will provide information on the nature of communications traffic and its volume, effectiveness of administration, requirements for system expansion and financial data.

G. Special Conditions

In addition to the question of system feasibility to be decided by Phase I of the study, implementation of Phase II will be subject to resolution of an issue now before the Federal Communications Commission.

1. The system to be studied is based on international use of ordinary telephone calls to transmit data. Such use is not presently authorized.

2. On January 8, 1976 the FCC determined that such service would be in the public interest and authorized AT&T to file a tariff for it after consultation with the international record carriers (IT&T, Western Union International, RCA and others) on their interconnections with AT&T to provide similar service. AT&T and the record carriers have to date been unable to reach agreement and the tariff has yet to go into effect.

3. The international record carriers have also appealed to the courts and filed petitions to reverse the FCC decision.

4. A reversal of the FCC order of January 8 authorizing international data use is not likely since regulatory decisions are not as a rule readily overturned by the courts. However, judicial and regulatory proceedings sometimes require months or even a few years before resolution.

5. A.I.D. would not proceed with field trials or later implementation of the system until the FCC authorizes the service.

6. Phase I of this project can be undertaken irrespective of FCC's position. If international data transmission over regular telephone circuits were still not authorized by the end of Phase I, its findings could be used by CGIAR to set up an identical system based in locations outside the U.S. where such service is available.

CGIAR Data Communications:

Scope of Work for Engineering Study

Phases

The project will be carried out in two phases. Phase I will be a feasibility survey and design of a low-cost data communications system for the CGIAR International Agricultural Research Centers. Phase II, subject to ~~contractor~~ AID agreement on its feasibility, will be the conduct of operational trials of the system among several of the centers and related institutions.

AID may terminate the study on completion of Phase I if, in the light of information obtained in that phase, it considers that Phase II is not justified.

Objectives - Phase I

Phase I has two main objectives:

A. To conduct an engineering study of an international computer polling system for the CGIAR centers, and determine its technical, economic, legal and administrative feasibility. The system should provide 24-hour electronic mail service to all nodes on the immediate system, and satisfactory means for reaching points beyond the immediate system.

B. To prepare a complete design and plan of operations for the system, including:

1. equipment on hand
2. equipment needed

3. modification of equipment, or development of new equipment, if justified
4. modification of telecommunications facilities at nodes, if necessary
5. nodes, routing, kinds and frequency of services
6. development of administrative framework and procedures concerning institutions of frequent use, addresses and telex numbers; hours of use; data rates
7. step-by-step development of the handling and transmission of data and text (formats for messages and technical reports, storage and indexing; mechanics for access to system; translation of materials from and into English)
8. means for transmitting data and text to points beyond immediate system
9. backstopping of system at system hub, including personnel requirements and administrative procedures
10. training requirements (support personnel at system nodes; oreintation and training procedures)
11. system costs (equipment, operations, managerial services other services, training)
12. schedules (equipment delivery times, beginning and duration of operational trials, training programs)

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Notes on Procedure

A. During the initial period of the contract, in the United States, through review of relevant reports, literature and developmental work already done and visits (including possible visits to Canada and Mexico), and other means, the contractor should:

1. consult with the Consultative Group on International Agricultural Research (CGIAR), and A.I.D. to learn of centers and other institutions, to be contacted as potential nodes of a communication system, and contact those U.S. institutions -- concurred in by AID -- to investigate the feasibility of their participation in the system;
2. learn the kinds of U.S. telephone facilities and services (e.g, direct dial, operator dialing) used in calling nodes overseas;
3. attempt to contact centers by telephone and record the time required to establish contact and make a subjective evaluation of quality of circuit established;
4. investigate equipment repair and maintenance requirements;
5. consider arrangements for use of a switching computer to switch messages received from and sent to points on the trial communications system;
6. consider advisability of subcontracting for switching, managerial or other services from an organization or individuals experienced in message-switching, electronic mail systems, or computerized data communications;

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7. consider with CGIAR, A.I.D. and others the desirability and need for eventual administrative and substantive backstopping of the communications system, including means for relaying messages beyond an immediate network, and possible staff involvement in operating the network;
8. consult, as necessary, with governmental and other organizations on U.S. and overseas laws and regulations concerning international transmission of data communications and take them into account in planning the design and testing of the system.

B. The contractor will make 8-9 site visits to proposed system nodes in Asia, Africa and Europe and Latin America, utilizing, if necessary, short-term consultants familiar with the local situation. On each visit the contractor should:

1. determine the nature of present telephone facilities and services by placing calls via telephone to computer installations for the purpose of gathering experience with data transmission over such circuits, and placing calls to locations in the U.S. and monitoring them to obtain circuit parameters (bandwidth, attenuation, etc.) needed to engineer any special modems, and/or acoustic couplers necessary to communicate data over such circuits at speeds of 300-1200 bps, and by such other means as necessary;
2. determine availability of equipment repair and maintenance facilities;

3. if telephone service proves unsatisfactory for project purposes, recommend necessary action to bring it up to requirements, or other means of improved communications, or why the particular location should not be included, at that time, in the proposed communications network;
4. determine, through direct contact or otherwise, the local Post, Telephone and Telegraph (PTT) regulations governing use of telephones for international and national data transmission, and PTT acceptance of such use;
5. consider, if appropriate and necessary, the use of other means, or combinations, of communications suited to an appropriate system for the agricultural centers;
6. ~~during visits, make complete plans for the operational trials that are to be conducted in Phase II, including equipment, delivery, administrative and other needs (Implementation will be deferred until agreement reached on Phase II.);~~
6. brief staff personnel and research scientists on purpose and workings of the communications system;
7. submit a report to A.I.D. on system feasibility, based on U.S. and field visits, which will include system design, cost estimates, training needs, and an outline of a continuing plan for monitoring traffic flow in the system.

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Phase II

If and when A.I.D. has determined that the system proposed as a result of Phase I is feasible, Phase II will be implemented.

Objectives - Phase II

A. To conduct trials of the communications system to obtain an effective test of the system through actual use. Its results should prove its technical feasibility, indicate the nature of the communications traffic and its volume, and administrative needs and problems, both for this and other potential LDC development uses.

B. Complete system design, in light of additional field visits and experience gained during Phase I.

Notes on procedure

In Phase II, the contractor should:

A. in cooperation with the centers, establish a 6 months trial period, providing technical guidance and basic procedures, monitoring the trials, assessing and reporting the results.

B. arrange for use of one centrally located switching computer and, at 8-11 centers and main points of communications, appropriate computer terminals and any necessary auxiliary equipment. Test planning and implementation should be carried out with sufficient nodes in the U.S. and other regions and over a sufficient period of time to give validity to the trials.

1. based on Phase I preparation, move promptly to effect earliest rental (or purchase) of the equipment to enable the trials to begin;
2. install, or provide guidance on installation and operation of equipment at system nodes;
3. arrange for switching, related managerial and system maintenance services, by subcontract if necessary;
4. in order to fully test the system a minimum framework and temporary procedures will be established concerning such items as codes and languages; data on rates; hours of use, institutions of frequent use and telex numbers; cost and use records, administrative procedures; training; and monitoring -- at participating nodes in the U.S. and overseas.

C. make field visits to or contacts with 6-8 additional proposed system nodes in Latin America, developed countries, and other LDC's, the locations and number of visits to be agreed to by A.I.D., for the purpose of adding them to the communication system, as feasible,

1. in so doing carry out the same functions as Phase I, except as Phase I experience dictates changes in those functions,

2. introducing them as additional nodes into the trial system, progressively and as feasible,
3. re-visit other nodes on the trial system, if necessary, to assist with and monitor the trials,

D. complete design of the system,

E. submit a report to A.I.D., intended for consideration by CGIAR, to include
1. a complete system design
2. economic analysis of system costs and cost effectiveness
3. projection of traffic volume and growth of system
4. training needs
5. administrative procedures
6. monitoring or evaluation procedures

ENVIRONMENTAL THRESHOLD DETERMINATION

TO: AA/TA, Mr. Curtis Farrar

THRU: TA/PPU, Mr. Carl R. Fritz

FROM: TA/PPU/EUI, William E. Vogelsang

SUBJECT: Environmental Threshold Determination

Project Title: CGIAR Data Communications Engineering
Project #: 910 1117
Specific Activity (if applicable) _____
REFERENCE: Initial Environmental/Examination (IEE) contained in PID dated August 1976

On the basis of the Initial Environmental/Examination (IEE) referenced above and attached to this memorandum I recommend that you make the following determination:

✓ 1. The proposed agency action is not a major Federal action which will have a significant effect on the human environment.

_____ 2. The proposed agency action is a major Federal action which will have a significant effect on the human environment, and:

_____ a. An Environmental Assessment is required; or

_____ b. An Environmental-Impact Statement is required.

The cost of and schedule for this requirement is fully described in the referenced document.

_____ 3. Our environmental examination is not complete. We will submit the analysis no later than _____ with our recommendation for an environmental threshold decision.

Approved: Curtis Farrar

Disapproved: _____

Date: 9/6/76.

Contents of Initial Environmental Examination

I. Examination of Nature, Scope, and Magnitude of Environmental Impacts

A. Description of Project

The project consists of a six month engineering study of a proposed small telecommunications system which would provide daily electronic mail service to CGIAR International Agricultural Research Centers and related organizations in various parts of the world. This would be a sixteen node network, utilizing existing telephone lines and existing equipment for a few minutes each day.

The study would employ only two or three persons in the U.S. and a few persons to make short visits to countries overseas.

B. Identification and Evaluation of Environmental Impacts

Since this is a study, and one of short duration, it will have no significant impact.

However, because it might lead to a subsequent project to implement the findings of this study project, we have examined the possible environmental impact of a follow-on project to implement the ultimate system.

The only possible environmental impacts of a later project would be in the areas of atmospheric, cultural or socioeconomic effects. The system could have no appreciable atmospheric effects because it would be used only a few minutes a day. It might have long-run cultural and socioeconomic effects but the beneficial effects should more than outweigh any conceivable detrimental effects, and the system would be but a tiny part of other rapidly changing communications activities going on world-wide.

It is therefore highly unlikely that even a follow-on project would have any significant environmental impact.

III. Recommendation for Environmental Action

That determination be made that the proposed project, CGIAR Data Communications Engineering, an engineering study, will have no significant effect on the human environment.

APPENDIX D

COUNTRY	PROJECT NO.	PROJECT TITLE	DATE	ORIGINAL / REVISION #	APPROVED
Worldwide	910-1117	CGIAR Data Communications Engineering			

FY / CY OR MONTH

CY 1977: June, July, Aug, Sept, Oct, Nov, Dec, Jan, Feb, Mar, Apr

CY 1978: May, June, July, Aug, Sept, Oct

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PRIOR ACTIONS

POST ACTION

Consultation with FCC 3

Consultation with FCC 7

Project Approved

PIO/T Issued 2

Contract Signed 4

Need for subcontract determined 5

Phase I Field visits begin 6

Decision on Phase II 8

Phase II trials begin 9

6 months trials completed 11

Consultation w/CGIAR re nodes & administration 1

Consultation w/CGIAR re Financing of ultimate system 10

ANALYSIS SCHEDULE: PROGRESS VS FINANCIAL

EVALUATION SCHEDULE

CRITICAL PERFORMANCE INDICATOR (CPI) NETWORK

COUNTRY	PROJECT NO.	PROJECT TITLE	DATE		APPROVED
Worldwide	910-1117	CGIAR Data Communications Engineering		X ORIGINAL REVISION # ____	

PROJECT PURPOSE (FROM PRP FACESHEET)

To study, design and test a low-cost computerized data communications network for up to 16 CGIAR International Agricultural Research Centers and related institutions.

CPI DESCRIPTION

1. 6/1/77 - Consultation with CGIAR
2. 6/30/77 - PIO/T issued
3. 7/1/77 - Consult FCC on status of order authorizing international data transmission by telephone
4. 8/31/77 - Contract signed
5. 10/15/77 - Need for subcontract determined
6. 11/1/77 - Field visits begin
7. 11/1/77 - Consult FCC on status of international data transmission
8. 1/31/78 - Phase II decision made
9. 3/15/78 - Phase II begins
10. 6/1/78 - Consultation with CGIAR re financing for ultimate system
11. 9/30/78 - Completion of project

APPENDIX C

AID 1020-28 (1-72)

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 77 to FY 78
Total U.S. Funding $230,000
Date Prepared: 3/1/77

Project Title & Number: CGIAR Data Communications Engineering 910-1117

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: 1. To improve the world food supply by improving agricultural research and development through better communications. 2. To test a communications system potentially usable also for other LDC development purposes	Measures of Goal Achievement: 1. Improved agricultural research 2. Improved management 3. Utilization of results of this study in other development fields	1. Increased research activities and qualitative evaluations of research 2. Better, more economical management, including reduced turn around time for research and administrative communications. 3. Study, experimentation or use of such systems or techniques in other developmental fields (such as population, education)	Assumptions for achieving goal targets: That a low-cost data communications system is technically, economically, administratively and legally feasible
Project Purpose: To study, design and test a low-cost computerized data communications network for up to 16 CGIAR International Agricultural Research Centers and related institutions.	Conditions that will indicate purpose has been achieved: End of project status. 1. 6 months (or more) of trials demonstrate that system operates effectively 2. Contractor's design and report is available for study for other development purposes.	1. Trials themselves will verify effectiveness of project 2. CGIAR, other donors and/or agricultural centers adopt and maintain the system on a permanent basis. 3. Awareness that such systems are feasible in LDC environments.	Assumptions for achieving purpose: 1. That technical means exist or can economically be developed to hook up the desired nodes of the system 2. That host countries will agree to use of telephone lines for data transmission, and that there are no pertinent U.S. legal or regulatory restraints on data transmission 3. That equipment can be satisfactorily maintained. 4. That system feasibility is determined in Phase I of project, thus enabling the implementation of systems trials.
Outputs: 1. Determination of feasibility of a low-cost communications system 2. Engineering design of the system for agricultural research centers 3. Results of actual tests of system to enable study of its potential for other LDC development uses.	Magnitude of Outputs: 1. 8 or more nodes of communications system participating in operational trials. 2. system design completed.	1. Actual system trials 2. Submission of contractor report.	Assumptions for achieving outputs: That a sufficient number of overseas research centers have telephone service adequate for conducting valid trials of the communications system.
Inputs: 1. Services to study, prepare design, and conduct trials of communications system 2. Managerial and maintenance services to operate and monitor system 3. Rentals of computer and computer terminals for system trials	Implementation Target (Type and Quantity) 1. Contract services (study and design) $160,600 2. Contract services (managerial) $12,000 3. Equipment and communications charges $57,000	Project records	Assumptions for providing inputs: That appropriate contract services and equipment suitable for LDC conditions can be obtained, as and when needed, for a system that is used in the U.S. but is yet to be tested overseas.