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INTENSIVE REVIEWS:
IRRIGATION DEVELOPMENT PROJECT PAPER

Honduras

Program Development & Support (PD & S)

(No. 522-9103)

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Submitted to:

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EXPERIENCE, INCORPORATED
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TO: William G. Kaschak, ADMD
USAID/Honduras

THROUGH: Richard L. Owens, Office of Rural Development

FROM: Robert A. Wesselmann, Extension/Training Spec.
Experience, Inc. Review Team Leader

SUBJECT: Intensive Review Team Report - Irrigation Development Project

The attached report represents my observations in complying with the Mission's Statement of Work on PIO/T II 522-9103-3-60036. The items covered are listed below.

Also included herewith are the separate reports of the four other members of the Review Team.

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Robert A. Wesselmann

Strategy of Intensive Review

The intensive review team provided by Experience, Inc., was composed of:

Robert A. Wesselmann, Extension/Training Specialist, Team Leader
Ivo Kraljevic, Anthropologist
William Shimasaki, Irrigation System Design Specialist
Morris Anderson, Contract Management/Procurement Specialist
Homero Silva, Environmental Engineer

The Team arrived in Tegucigalpa on March 4, 1986, except for the Environmental Engineer who arrived on March 12. Briefings were held at the USAID and at the Department of Water Resources of the Ministry of Natural Resources.

The first week was devoted to individual conferences with USAID and Ministry staff as each team member pursued the various tasks prescribed by USAID.

While the Management Specialist was occupied with administrative procedures of AID, GOH, and private firms, the rest of the team started a series of field trips to the areas surrounding Comayagua, San Pedro Sula, Juticalpa, Catacamas and Choluteca. The group divided at times in order to study particular concerns. Among the visitations made were:

Regional MNR offices
Regional DRH offices
Commercial irrigation schemes
Small and medium irrigation projects (active and inactive)
Farmer groups
Individual farmers
Experiment stations
Training centers

Agricultural export organizations

Land reform areas

Other donor projects

Specific farms, sites and groups visited included:

Agalteca Farmer Group

Andrés Mejía, individual pilot farm

Casanave Rice Experiment Station

Catacamas Agricultural Training School

CEDA Irrigation Training Center

CIDA Pilot Projects in Juticalpa area

Cooperativa Berlín

Cooperativa Brasil

Cooperativa San Antonio

CREHSUL Marketing Cooperative

FEPROEXAAH

FIAH - research foundation

Herradura rice cooperative

José Manuel Tejeda - individual pilot farm including livestock

La Lujosa Research Station

La Manzanita - individual farmers

La Trinidad cooperative

Limón de la Cerca group

Naranjal farmer groups

Palmerola Project

PATSA (United Brands Co. contractor and exporter)

Presa de El Guayado

Pugunea rice cooperative

Quebrada Seca group

Rancho La Florida

San Rafael de Basas cooperative

Santa María de Réal farmer group

The remaining time was devoted to further individual meetings with staff members of USAID, DRH, MNR, INA other GOH agencies, and other donor representatives. During this period, the team members reviewed their findings with staff at the DRH and adjusted details as they seemed warranted.

The draft was given a review at the USAID on April 1, and additional modifications were considered.

The entire report consists of individual reports requested by the Statement of Work, additional observations which should be considered in preparing the Project Paper, and supporting annexes.

The Team departed Tegucigalpa on April 4, 1986.

ACRONYMS

AID	Agency for International Development, Washington
AID/Honduras	The AID Mission in Honduras
ARG	Agrarian Reform Group
BANADESA	National Agricultural Development Bank
CIDA	Canadian International Development Agency
CEDA	Irrigation training center at Comayagua
DIFOCOOP	Directorate of Cooperative Development
DRH	Department of Water Resources
DRI	Integrated Rural Development
ENA	National Agricultural School
FAO	Food and Agricultural Organization of the United Nations
FENACH	National Federation of Farmers and Ranchers
FEPROEXAAH	Federation of Agricultural Producers and Exporters
FHIA	Honduran Foundation for Agricultural Research
GOH	Government of Honduras
IBRD	The World Bank
IFB	An AID document, Invitation for Bid
I.A.	Ingeniero Agrónomo, particularly those assigned to farmer groups
IHCAFE	Honduran Coffee Institute
INA	Institute of Agrarian Reform
INFOP	National Institute for Professional Training
JICA	Japanese International Cooperation Agency
MNR or MRN	Ministry of Natural Resoures, Honduras
PASA	Participating agency service contract, AID
PSA	Property Supply Agent, AID
PID	Project Implementation Document (AID)
PIO/C	Project Implamentation Order for Commodities (AID)
PIO/T	Project Implementation Order for Technical Services (AID)
PSC	Personal Services Contract, AID
PROMECA	Agricultural Mechanization Organization
RFP	An AID document, Request for Proposal
SANAA	National Water and Sewage Commission
SIPCAR	Visual Production Unit of INA
USAID	The AID Mission in Honduras
T.A.	Technical Assistance as a topic, or technician
UNICOOP	Union of National Agricultural Services Co-op

PERSONS CONTACTED

Name of Person	Position/Place of Work
Korefumi Amano	Irrigation Training Center, JICA
Orlando Avilés Alcántara	Department Chief of Drainage and Irrigation (MNR)
Ernesto Bondy	USAID Rural Development Office
Valentín Bonilla	In charge of sales, Ford Honduras
Arnold Bueso	FEPROEXAAH Specialist
Jaime Bustillo	Asociación Hondureña de Ecología
Roberto Cáceres G.	Social Scientist, DRH
Rafael Carrasco	Head of Northern Region, El Progreso, INA
Robert Carroll	Contract - Contracting Officer, USAID
Arturo Castellón	Financial Analyst, AID
Mario Cesar Castro	Rural Development Division, INA
Rodrigo Chávez	In charge of sales, Chevrolet, Honduras
J. Arnaldo Chirinos	Agriculturist Economist, DRH
Mario Contreras	Research Director, FHIA
James Corley	USAID Contracting Officer
Jesús Coto	Manager, PATSA (marketing firm)
Hugo Erazo	Chief of Extension, Juticalpa
Morgan Erazo	In charge of sales, American Motors Corp., Honduras
Juan Mariano Flannels	Rural Development Division, INA
Pedro Alfonso Flores	Technical Assistance Coordinator, Northern Region, INA
Raúl Flores	SIPCAR Video Specialist
Marco Fortín	Wang Representative
Pierre Giroux	1st. Secretary, Canadian Embassy, Guatemala
Valeriano Godoy	Local Contractor
Walter Gomez	USAID Office of Economic Program Analysis
Julia Bustillo de Gómez	SANAA
Paco Gonzalez	DRH Agronomist, Choluteca

PERSONS CONTACTED

Name of Person	Position/Place of Work
Leonel Guillén	Superintendent of CREHSUL Marketing Cooperative
Yasuro Hagihara	JICA Tegucigalpa Office 2/DHR
Erasmo Henriquez	Program Analyst for DRH (Computer)
Juan Herane	CIDA Tegucigalpa Office
Oscar René Herrera	DRI, Tegucigalpa
William Kaschak	USAID Development Finance Office
Jaime Lanza	Chief of Planning Division, DRH
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Christine Lyons	USAID Commodity Officer
Edmundo Madrid	USAID, Engineering Office
Mario Maresma	Director, Departamento de Recursos Hídricos, Ministerio de Recursos Naturales
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Manuel Antonio Martínez	Planning Deparment, INA
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Carlos Mejía	Agronomist, Juticalpa
Carlos Moncada	DRH Contracting Specialist
Jorge Montero Vásquez	Caterpillar Co. Representative
Mario Moradel	Extension Specialist, DRH
Saiji Naito	Hazama Construction Company Choluteca Manager
Yoshiaki Nakajma	Hazama Construction Company Choluteca Office Manager
Ricardo Nasser	Local Contractor
Elías Nazar	Technical Assistant Comayagua zone, DRH
Richard Owens	USAID Rural Development Office
Hector Padilla	Regional Chief of Extension, Catacamas
Feliciano Paz	Ministerio de Recursos Naturales

PERSONS CONTACTED

Name of Person	Position/Place of Work
Mauricio Pavón	In charge of sales Wang, Honduras
Richard Peters	USAID Office of Rural Development
Juan Miguel Pinel Pineda	Regional Director MNR, San Pedro Sula
Vice Minister Ing. Quezada	Ministry of Natural Resources
Jesús Ponce Sandoval	Planning Department, INA
Armando Rivera Canales	DRH/CEDA, Comayagua Training Center Director
Roberto Rivera	Sub-Director, DRH
Carlos Rodríguez Estrada	National Chief of PNUD/FAO Projects, DRH
Carlos Rodríguez	Chief of Operations, CREHSUL
Francisco Ruíz	Chief of PROMECA
Jorge Salgado	DRI, Tegucigalpa
Alcides Sandoval	Local Contractor
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Pompilio Tinoco	DRI, Tegucigalpa, Lawyer
Luis Roberto Torres	Planner, DRH
Miguel Turcio	Choluteca
Antonio Valle	DRH, Operations and Maintenance
Roque Vaquero	FHIA Research Associate
Pedro Vásquez	Regional Director, Catacamas
Roberto Villeda	Asesor, Ministry of Natural Resources
Enrique Zelaya	Ministerio de Salud Pública
Julio Zepeda	USAID Rural Development Officer
Oscar Zelaya	DRH

Extension/Training Review

R.A. Wesselmann

Task No. 1. Develop training plans, both on and off farm for the potential project beneficiaries, related to the maintenance and operation of irrigation systems

Pre-selection stage:

After a group has presented a "solicitud" for the provision of an irrigation system to the members' farm plots, and after an initial feasibility determination has been made, all of the potential members, including wives, would participate in a series of meetings at the village level. This will introduce them to the basic principles of irrigated agriculture and the possible changes necessary in cultural practices. They will be shown the additional new departures such as channel construction and maintenance, various types of irrigation (such as flood, drip and rill), precise scheduling and monitoring of water use and the responsibilities of each member to the welfare of the entire system. A second aspect will discuss the organization and responsibilities of the water user group, election of officers, and the role of each member, and the availability, mechanics, and obligations in the use of credit.

It is planned that pre-packaged presentations will be produced for this purpose on videotape for use in the community. A member of the regional or district office would be present to encourage group discussions on the subjects presented. And the prospective clients would be encouraged to further discuss the ramifications of the new venture among themselves.

Post Selection Training

In the event that the farmers are unanimously willing to proceed and the site is selected for implementation of the project, the members

will proceed to the second phase of training with the participation of the DRH agronomist assigned to work with this group.

1. Group organization (election of officers, naming of committees, selection of crops, credit applications, marketing arrangements).

2. Field trips to demonstration plots under various systems of irrigation and crops, and to sites currently under construction. The group should also be given an opportunity to talk with members of other user groups.

3. Presentation of videotaped films, in their community, detailing the construction and maintenance of small irrigation systems.

Soon after these sessions are completed, the DRH agronomist will meet with the group or its committee to plan the timetable for actual construction and the involvement of the members.

The DRH agronomist will serve as the technical advisor for the group and its liaison with other agencies. The agronomist will live in the community and will prepare and maintain a small demonstration plot as a teaching model. He (or she) will be able to call on the resources of the IMU and regional MNR offices; may arrange an annual field day of visitations to other projects which are somewhat more advanced; will serve as an advisor to the group at its meetings; and will provide occasional video film showings as feasible.

Also envisioned is one-time in-service training course, of about one week duration, for two to four leaders of each group at the Comayagua Training Center:

Farmer Training:

Year	Total Groups	Total Farmers	Cost/tour	Cost/LDR TRG	Agron CTC[1]
I	12	240	1800		12x2250=27,000
II	24	480	1800+1800	48x150=7200	27,000
III	36	720	1800+2400	48x150=7200	27,000
IV	48	960	1800+2400	48x150=7200	27,000
V	60	1200	2000+2700	48x174=8352	30,000
VI	72	1440	2000+2700	48x174=8352	[2]
			$11200+12000	$38,304	$138,000

(1) Est. 90 days x $25/day (including maintenance), 12 agronomists per year

(2) I.A.s from year I will move into new areas and will have already had this training

Task No. 2 Identify the in-service and long-term training needs of the GOH implementing agency and design a program to meet these needs.

The intensive review team felt that the present DRH staff and allied GOH staff were generally well-qualified and present in sufficient numbers to accomplish the Project objectives. Plans for involving additional graduate agronomist engineers seemed reasonable and would number about 50. The DRH expects to be able to provide qualified counterparts for the expatriate technical experts and the MNR has a surplus of agronomists. Many of the staff have had overseas training. The most apparent needs are for in-country refresher training and associated costs.

The new Comayagua Irrigation Training Center (provided by the Japanese Government) should be able to provide training. Project loan funds will be utilized to cover the costs of the refresher

training available in the CTC Middle Course and Advanced Courses A and B.

Each course is of one-month duration at each of these levels. The Center is newly-built and, when all of the equipment arrives, it will boast several modern soil, water and compaction laboratories, as well as demonstration plots in flood and drip irrigation. Several members of the DRH are seconded to the Center in faculty positions.

Annual Budget Estimate for staff in-service training:

30 persons x 30 days x $25/day = $22,500 x 5 yrs. = $112,500

Project Ingeniero Agrónomo Training

Each year, DRH will appoint 12 agronomist engineers to the Project, preferably from among university graduates, - possibly some from existing staff. University graduates are required to give one year of public service after graduation at a minimal salary of 1,000 Lempiras per month (US$500). After the year of satisfactory service, they become full-fledged employees at Lps.2,700 per month (US$1,350.00). Present plans are to interview interested candidates the year prior to graduation. Selected candidates may be asked to revise their final year's course work to relate more closely to the Project activities. Immediately upon graduation, the 12 agronomist engineers will be given specialized irrigation training for 3 months at the Comayagua Training Center. The subjects presented will be geared to the Project implementation at the village group level. In addition to the coursework already planned by the CTC, the training will incorporate such topics as:

Project administration
Group organization
Group dynamics
Parliamentary procedure
Credit facilities

Technical resources available
Identifying village leaders
Individual and group psychology and behavior
Communications techniques
Maintaining farm records
Teaching methods and audio-visual techniques
Method and result demonstrations
Farm tours, field days
Keeping meteorological and irrigation readings
Environmental considerations and observations

Each I.A. will then be assigned to a village, which has been selected as a new project site, where he or she will be housed and will serve as the DRH contact with the farmer group. During the first year, the I.A will serve as general extension agent, will help the farmers to organize, and will participate in the indoctrination and training of the group. (See Farmer Training above).

A constraining budget has also seriously limited the travel of DRH specialists (vehicles, maintenance and fuel) to activity sites for monitoring and outreach services (construction, extension and surveys). The Project's technical assistance component should alleviate this noticeably and some funds will be needed for additional transport and vehicular expense. The long-term experts working and traveling with their counterparts should accelerate the practical field experience of the DRH staff.

Task No. 3 Identify other types of assistance that would complement the provision of irrigation interventions

There are several entities, both national and international, which have been attempting to give impetus to irrigation development in Honduras. The Ministry of Natural Resources' Extension Agents are cooperating with DRH staff in the regions and districts. Among the international agencies are AID with several related projects; Louis Berger Consultants are surveying the potential for other crops for

export; the Academy for Education Development is exploring the possibilities for increasing the production of teaching aids and information services; the Chinese Government in rice seed multiplication; the Canadian Government in surveying of potential irrigable areas and establishment of demonstration pilot projects; the Japanese in establisning an irrigation training facility; the Israeli support of La Lujosa Research Station; the Honduras Foundation for Agricultural Research in export crop investigations; the World Bank; FAO; the Institute for Agrarian Reform; as well as various marketing organizations.

The GOH concern for a national plan is very understandable. In the meantime, any new activity should attempt to build upon the resources which already exist and avoid further fragmentation of efforts. With this in mind, the Project intends to provide a liaison element through one of the provided technicians. It also intends to make use of the facilities provided at the Comayagua Training Center; to encourage DRH to exploit the feasibility studies and demonstration trials already made by the Canadian International Development Agency; and to resuscitate or extend irrigation schemes which are economically viable. Other opportunities will most certainly surface as the Project is implemented.

One such opportunity is apparent in the development of motivation and training modules for use at the farmer level. The use of video cassette "canned" segments should be a most effective aid in this regard. The establishment of a production unit within the Project would require a sizeable investment in time, training and money - but such a facility already exists in the Instituto Nacional Agrario and was established with USAID support. A staff member of INA's video production unit, SIPCAR, which has already produced some professional quality work for the DRH, is of the opinion that the Centro could expand its service to the DRH and to this Project with the provision of a few items of additional commodities. The funds involved are paltry in comparison with the cost of having a single production made commercially, or compared with the cost of establishing yet another production unit in the DRH.

This Project could well use at least 4 or 5 tapes of one-half hour duration each during the first two years of the Project, for use with all new or prospective farmer groups. The following commodities should be provided in support of this production and utilization:

For SIPCAR of INA: (Specs must be compatible with present equipment)

1 SEG special Effects Generator, color, compatible with Sony U-Matic system, 110 volts, 60 cycle AC	Est. $4,000
1 Video Camera, professional, compatible with present U-Matic system (specs needed)	Est. $6,500
18 Video Tape Cassettes for U-Matic System at $15/each	Est. $ 270
1 Slide/Cine-to-Tape Convertor, folding book type (Hudson Photo Ind. sug.)	Est. $ 50
1 Video Cassette Recorder, Beta, SP speed, table model, NTSC, 110 V; 60 cycle AC;	Est. $ 400

For DRH Training/Extension Office

20 Video Cassette Tapes, Beta, 2 hour capacity at SP $7/each	Est. $ 140
1 Video Cassette Recorder, Beta format, SP speed, table model; NTSC, 110 volt-60 cycle AC	Est. $ 400
1 Video Cassette Recorder, VHS format, SP speed, table model, NTSC, 110 volt, 60 cycle AC	Est. $ 400
1 Slide/Cine-to-Tape Convertor, folding book type, (Hudson Photo Ind. sug.)	Est. $ 50
1 Portable Video Camera/Recorder, single unit, lightweight, Beta format	Est. $ 1,250
24 Video Cassette tapes for above camera at $8/each	Est. $ 192
1 Portable camera tripod, with adjustable elevator	Est. $ 100
1 Signal splitter for operating 2 monitors from one VCR	Est. $ 15
2 Portable Adjustable TV stands, metal; with shelf, for 19" TV Monitor at $75/each	Est. $ 150
2 video color TV monitor/receiver, 19 inch, NTSC, 110V 60 cycle AC	Est. $ 1,000

1 Portable electric generator, 1.5 KVA output 110-volt, 60 cycle AC, gasoline or diesel	Est. $	850
1 Extension cord, outdoor type, ground wire, 50 ft. long, triple outlet, 110-volt, 20 amp.	Est. $	50

<u>For 2 field units</u>

2 video cassette recorder, Beta Format, SP speed, table model, NTSC, 110 V. 60 cycle AC	Est. $	800
4 Video color monitor/receivers, 19" at $500/each 110 volts, 60 cycle AC, NTSC	Est. $	1,000
2 Signal splitters for operating two monitors from one VCR	Est. $	30
4 Portable adjustable TV Stands, metal, with shelf; for 19" TV monitor	Est. $	75
2 Portable electric generators, 1.5 KVA output, 110-Volt 6 cycle AC; diesel or gasoline	Est. $	1,700
2 Extension cords, outdoor type, grounded, 50 ft. long triple outlet, 110-volts, 20 amp.	Est. $	100

Task No. 4 Review capabilities of representative private sector engineering/construction firms and make recommendations regarding training requirements

The procedure currently in force for letting construction contracts involves an autonomous agency, PROMECA, established by the GOH. This is essentially an agricultural equipment pool, with some earth-moving equipment. If it can handle the job, it does so. If for any reason, it cannot, it passes the job out to private firms on a bid basis. There are several private firms which have undertaken contracts with the MNR. If they are in need of additional equipment, they often rent the additional needs from PROMECA itself, or from other firms. Team members talked with private firms, and staff members at PROMECA, and the DRH and saw their equipment pools. Additionally, the team saw numerous irrigation schemes constructed by them.

Although there were weaknesses noted, it is felt that the capability exists for proper construction of irrigation systems but that closer and continuous monitoring by experienced irrigation engineers of the DRH is necessary in future undertakings.

Task No. 5 Develop guidelines for the application of mass media in delivering technical know-how to the beneficiaries.

Ample channels already exist for delivering technical information to farmers. Occasional articles appear in the daily newspaper. The INA publishes a bi-monthly newspaper, "El Guarizama", which carries several pages of crop cultural advice as well as publicity about the agrarian program. A weekly newspaper, "El Agricultor", is published in Tegucigalpa and is devoted exclusively to farm news and technical advice. Regular radio programs are listened to by rural families, and the DRH units are free to contribute to the program material through the MNR Extension Department. Several governmental agencies and semi-private groups provide leaflets and data on crop production, particularly export crops. Annual fairs are held throughout the country and offer an opportunity for publicity and motivational messages.

Given the specificity and wide dispersion of the target audiences which will be involved in this proposed project and the relatively low literacy rate of some of the rural participants, it is recommended that the use of audio and visual teaching media be exploited, principally farm tours, field days, field demonstrations, video tapes, color slide presentations, and short formal training courses.

Farm Tours and Field Days - will be utilized for farmers in the site pre-selection stage and pre-construction stage. Follow on tours are planned at least once in the second year, and once in the third year, to sites which are exemplary. A bus would be hired by the DRH for this purpose.

Field Demonstration - The "live-in" agronomist will prepare and care for a small demonstration plot at his or her operating site. This will be used for both method and result demonstrations.

Color Slides have been and are being made and used by the DRH staff in specialized training at all levels.

Short training courses - The DRH intends to select farmer leaders from the Project areas to attend a one-week course at the Comayagua Training Center in the second year of operations in each district. Thus, each year, a new group of leaders will be convened at the Center. Training will be more technical than is provided at the village level and will provide a deeper understanding of irrigation principles and of farmer group management and operations.

Video tapes present a medium which can be useful at all levels of technology transfer. It is planned to utilize video at the outset in the familiarization stage for prospective farmer clients, and at a later date for farm families in the specific sites which are selected. Since each group will be under the guidance of a different agronomist or social promoter, the video approach will insure that the same message is given to each group.

Video tape production facilities are operating at INA's SIPCAR. With some financial or material support from the DRH, SIPCAR has already produced some videotape for the DRH, and it is of professional quality. It is envisioned that each teaching module for use with farm groups can be capsulized, using a carefully prepared script, thus insuring uniformity in the information given to every group. Slides and 16mm films can also be incorporated with the live action footage, to be complete in a single cassette. It is planned to provide each participating field IMU (two at the outset) with a VCR player, two TV minitors and a small portable electric generator.

As the project progresses, it is planned to prepare additional tapes for additional topics at the farm level, and for use in refresher

courses for DRH I.A.s. There are many video tapes on irrigation subjects now available in the US. Some funds should be used for assembling a small library of tapes at the national headquarters of the Project.

Allocation for videotape library	$ 1,000

Project Administration - The IMU

From the outset, there was inconsistency in the understanding of the Project's proposed administrative organization.

One interpretation indicated that a new and separate section would be created in the DRH at its Tegucigalpa headquarters and would be known as the I.M.U. (Irrigation Management Unit). The GOH personnel assigned to the Project would be officed with the T.A. counterparts in this separate unit. The staff would be increased at the national and regional or district level, but major control of activities and coordination would rest with the headquarters office.

A second interpretation identifies the I.M.U. as the regional or district field office which would implement the project activities in its area of operations. The present regional or district personnel would be increased to about 5 and would include an irrigation engineer, at least one topographer, a designer/draftsman, an extensionist (or Social Promotor), and an agronomist. Much of the initiative and decision-making would reside at the regional or district level. The DRH indicates that 7 regional or district IMUs will be established during the life of the Project. The headquarters staff and T.A.s would be officed in the existing sections of the DRH. As technical assistance to the Project winds down, the Honduran staff would continue the operations in their own sections without any radical changes.

In either interpretation, a separate office would be prepared for the DRH Project Manager and the T.A. Team Leader. The DRH also hopes to streamline the administrative channels for the Project.

Operating within its time constraint, the intensive review team was not able to find nor negotiate a definitive response to the administration and physical location of the so-called I.M.U. This will require further meeting of the minds between the DRH and USAID before final preparation of the Project Paper.

Project Inputs

The team recommends that the PID estimate of technical assistance be altered. A team leader to counterpart the DRH project manager will be needed for the life the Project. Other positions will be for shorter terms and are estimated. Evaluation of these needs should be made continously and adjusted as the Project progresses.

Long Term:

Team Leader	7 years
Agronomist	3 years plus 3 subsequent short terms of 2 months each = 6 months
Irrigation Engineer	2 years plus 2 subsequent short terms of 2 months each = 4 months
Extension training	2 years
Social Scientist	1 year plus 1 short term of 3 months = 6 months
Water Policy Specialist	1 year
Marketing Specialist	2 years plus 2 subsequent short terms of 2 months each = 4 months (Allow an additional 4 person-years of long term)

Short term:

Environmentalist	9 months plus 3 short terms of three months = 18 months
Other	24 person-months as needed = 24 months
Total	Long-term - 22 person-years, = short-term 62 person-months

Project Outputs

The intensive review team felt that the outputs listed in the PID need to be modified.

The number of new or rehabilitated systems which can be realized in the 7-year project should be reduced to 200.

Of these, approximately 126 would be small systems involving not more than 2,500 small farmers on about 2,000 hectares. Medium and large size tracts of up to 100 hectares could number approximately 74, irrigating perhaps 3,700 hectares. An estimated 1,800 farmers and farm workers would be impacted.

The total hectareage would thus reach 5,700 but could be much more, depending upon the size of the larger systems. The number of farmers directly impacted would be about 4,300, but the diffusion effect of the activities would be difficult to measure. It could add another 1,500 fringe farmers neighboring the irrigated plots, bringing the total of direct and indirect beneficiaries to 5,800. Other services, ancillary to farming, (such as transport, marketing and construction workers) would boost the number of total beneficiares.*

Among the output indicators, the present training plans would increase the number of DRH technicians trained to 50, rather than 20. These will be primarily the new "Ingenieros Agrónomos". In-service training for existing staff would add 40 more, including counterpart training and refresher course participants.

*It should be noted that the number of individual farmer beneficiaries does not take into account the other members of the farm family who also will benefit from the added household income.

IMPLEMENTATION STRATEGY (PID III D)

It is recommended that the basis for site selection be modified to include additional factors. The PID Lists:

Economic Return
Proximity to Local Markets
Potential for Crop Diversification
Ease and Speed of Installation
Environmental Impact

Other factors to be considered are:

Enthusiasm of Group Members (toward irrigating project)
Previous "Track Record" of Group (credit, productivity, previous projects)
Likely Demand for the Increased Production (at contemplated price)
Availability of Labor (throughout crop seasons)

The "Ease and Speed of Installation" must consider the number of farmers or the total acreage which will be benefited.

Each of the factors should be studied carefully and scored on a basis of say, 0 to 5, with 5 representing the highest positive score, and 0 an unacceptable situation.

The areas receiving the highest total scores should be the most likely prospects, but a score of 0 in any factor would eliminate it unless and until the constraining factor is resolved. The highest economic return potential should not be the overiding determinant.

To cite examples:

1. Area X may offer the greatest economic potential but if there will be little or no demand for the produce, the project is not feasible.

2. All factors may appear positive but if the group is "turned off" by the extra work involved in a longer growing season, the prospects for viability of the project will be dimmed, regardless of the promised economic returns.

3. A rehabilitated scheme flags a repeated failure unless the original shortcoming is overcome.

In short, the project should not assume that added income is the farm family's only consideration in improving its quality of life.

Job Descriptions

Team Leader - Represents contractor. Liaise between USAID and DRH. Counterpart to DRH Project Leader. Handle administrative matters of T.A. team and consultants.

Qualifications: Academic degree in agriculture. Minimum 5 years experience in the field of agriculture in the U.S., plus 5 years experience in agriculture in Latin America, at least 2 years of which were associated with an AID-supported project. Supervisory and administrative experience. Previous experience in irrigation development is desirable. Negotiating experience with Ministry level officials. R-3, S-3 level in Spanish.

Agronomist - Serve with counterpart at national and regional levels in determining soil and water requirements for various tropical crops, including cultural recommendations and pest control. Conduct training for DRH agents. Assist in planning of cropping systems under irrigation. Large percentage of time will be spent in field.

Qualifications: Advanced degree in agriculture with specialization in agronomy. Minimum of 5 years agricultural experience in the U.S., plus 5 years experience in agriculture in Latin America. At least 4 years experience in irrigated agriculture. Previous experience in donor-supported development projects is desirable. Spanish R-3, S-3 required.

Extension Training Specialist - Serve with counterpart in planning and conducting training programs for extension workers and for farm audiences, in both formal and informal situations. Participate in such training in regard to agricultural extension methods. Aid in planning and producing training materials such as demonstraton plans, flipcharts, slide sets, videotapes, and audio cassettes. Will spend a fair amount of time in the field. Will liaise with other agencies involved with extension-related matters.

Qualifications: Academic degree in agriculture. Course credits in agricultural extension methods and communications. At least 5 years experience in agricultural extension in the U.S., and 5 years experience in Latin America, including use and production of audio-visual aids, particularly for low-literacy audiences. Previous experience in irrigation development projects is desirable. Spanish fluency R-3, S-3 mandatory.

Marketing Specialist - With a DRH counterpart, he will explore and keep current with market trends and forecasts on crops produced for domestic consumption and for export. He will need to establish and maintain contacts with marketing organizations, both private and in the cooperative sectors. He will serve as a resource person for newly forming groups of small farmers at both the pre-selection and post-selection stage. He may become involved in crop storage possibilities and production credit matters. A fair amount of travel within the country will be required.

Qualifications: Graduate degree in agriculture with specialization in storage and marketing. At least 15 years of agricultural marketing experience to include at least 5 years in Latin America, and 3 years with tropical fruits and vegetables produced for export. Spanish fluency of R-3, S-3.

April 3, 1986

TO: William G. Kaschak, ADMD

THROUGH: Richard L. Owends, O/RD

FROM: Ivo J. Kraljevic
Experience, Inc. Review Team

SUBJECT: Social Considerations Review

Attached is the subject review of recommended social considerations to be used by the United States Agency for International Development (USAID) and the Directorate of Hydraulic Resources (DRH) in the elaboration of the project paper for the Irrigation Development Program.

SOCIAL CONSIDERATIONS REVIEW

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A. SMALL FARMER SELECTION CRITERIA

Review Question 1: Develop appropriate selection criteria to ensure that small farmers will be able to participate in and benefit from irrigation interventions.

According to the 1984 national agrarian survey [1], there are nearly 255,000 farms in Honduras. This figure represents an increase of 60,000 farms in the ten years since the agrarian census of 1974. Unfortunately the 1984 survey does not report the distribution of farms by their size. In 1974 farms of less than 50 hectares accounted for 96 per cent of all farms [2] and 707,662 hectares. Farms of less than 5 hectares in size, accounted for nearly 64 per cent of all farms, for 72 percent of the farms under 50 hectares and for 248,679 hectares. In the ten years since 1974, the proportion of small and medium size farms is only likely to have increased. Thus, the pool of potential project clients is rather large since the project aims to bring water for irrigation to 6,000 - 7,000 hectares.

Although it is impossible to say how many small or medium size farms are potentially irrigable, it is safe to assume that their number is larger than the number the Project can attend to. Consequently, the simplest criteria for client selection, that ensures small farms will benefit, is to set a portion of the Project funds for the exclusive use in irrigation systems serving small farms.

Additional safeguards to ensure that small farmers will benefit have been built in the design of the various components of the Project, such as the training and extension component, as well as the preliminary activities plan proposed by DRH described elsewhere in the Intensive Review. (See R. Wesselmann's report).

(1) Encuesta Nacional Agropecuaria, 1984

(2) Diagnóstico del Sector Agrícola, Tomo II, Junio 1974, p 152

Since irrigation sites are largely determined by technical (physical factors related to land water availability) and economic considerations, it is likely that any given potential irrigation site will include different size farms within it. All other factors being equal, the Project should give preference to sites where small farms predominate. This criteria can be used as one of the qualifying factc , in the site selection process.

Site identification should be oriented to areas known not only to have the needed physical and technical requirements, but also to have concentrations of small farmers. In the initial stages, the Project should gather data and study the spatial distribution of farms within the selected priority areas. Promotional efforts should be directed to sites identified as having those requirements. In addition to using GOH field staff, the Project will work with private institutions such as FEPROEXAAH, UNIOCOOP, and FENACH. These private sector agricultural intermediary organizations will allow the Project to reach the large number of independent small and medium size farmers, largely unattended by GOH agencies. According to the already cited 1984 survey, only 3 per cent of all farmers in the country receive technical assistance from 5 GOH agencies. (p. 58. the agencies are MNR, INA, IHCAFE, DIFOCOOP and INFOP).

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B. COST/BENEFIT ALLOCATION AMONG USERS OF IRRIGATION SYSTEMS: WATEF USERS ASSOCIATIONS

Review Question 2 Develop appropriate terms and conditions for the organization of water users associations that would allow Project beneficiaries to bear a portion of the construction costs for irrigation systems, as well as the entire cost of irrigation maintenance and operation.

For purposes of this review, the system types identified in the PID need to be modified to take into account the organizatonal requirements of each system and the socio-economic conditions of the users. Using this criteria, the proposed irrigation systems, and partial data from a survey of 246 existing irrigation systems (1), a typology of systems will be developed in order to assess the appropriate terms and conditions for user organization and cost recovery.

1. Single Farm Unit Irrigation System

Privately owned, operated and maintained irrigation systems account for nearly 60% of all systems surveyed and for over 80% of the total land currently under irrigation. The majority of these systems use pump irrigation followed by small diversion structures from streams. This type of system irrigates all sizes of farms, from farms of less than one hectare to several thousand. It is used by farmers of every social and economic stratum, and with varying degrees of water use sophistication and efficiency.

The project will promote this type of system where technically and economically feasible. It can be expected that a considerable

(1) Dirección de Recursos Hídricos (DRH) ongoing census of irrigation systems in Honduras is estimated to have covered over 95% of all existing systems thus far.

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proportion of the systems to be developed by the Project will be of this type given the Project objectives to benefit small and medium sized farmers and to promote relatively simple systems.

Under current conventions, all four components of the single farm irrigation systems at the local level, are under the farmer-operator control. Construction as well as operation and maintenance costs are the sole responsibility of the owners-users. In fact, irrigation in this type of system is considered one more production input.

The feasibility of this type of system rests on economic and financial soundness of the farm operation. There are no user organizational requirements at the local level for operation and maintenance since there is only one user.

Social considerations may enter at the source and disposal ends of this type of systems. It is at these points that this type of system may have social impacts by affecting other users sharing the same water stream or underground reservoir at the source of the system, and by flooding or contaminating neighboring units at the disposal end.

This type of potential problems is, however, usually dealt with as part of watershed management and is the responsibility of extra-local governmental authorities. In Honduras, the DRH is charged with this responsibility.

To increase economic and physical efficiency in this type of systems, the Project should offer technical assistance, credit and training tailored to fit the needs of the small and medium size farmer. Where a large number of these systems exist in an area, the Project might promote grouping of the owner-users to facilitate delivery of technical assistance and training.

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2. Agrarian Reform Group (ARG) Farming Collectively

A second form of single farm unit irrigation system is found among ARGs farming collective parcels. Currently, this type of system is subsidized by the GOH both in construction and operation and maintenance costs. In addition a large number of such systems are either abandoned or underutilized. Careful review of existing systems that need rehabilitation will be necessary since technical design flaws and financially non-viability seem to be important reasons for abandonment.

Systems used by ARG groups need not be treated any differently from individually owned systems. However, they may require easier repayment terms due to the generally low income levels and heavy debt burden of most ARGs. GOH policy toward ARG needs to be examined and a clear policy formulated to spell out the terms of ARG participation in the Project. This policy should be obtained as early as possible, and before the initiation of the Project activities.

There are some 2,000 ARG groups in the country with a registered membership of some 50,000 families. The actual member of families may be lower due to high desertion rates, however, it is an important segment of the rural poor population and an important political interest group. A large portion of GOH rural and agricultural services are oriented towards this population. The actual average size of the groups is 20-25 families.

If an ARG irrigation system is not shared with another group or with independent farmers, it is a single farm unit system. Thus, the operation and maintenance is an internal issue. Since these units are operated by a group, organizational factors can affect the economic efficiency of the farm including the irrigation system. In general, if the organizational strength of the groups is weak, their economic efficiency is low. The reasons are numerous and very complex. The following are the most apparent:

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- Heavy debt burden acquired in some cases by previous individuals no longer with the group. Debt accrues to the land and not to the individuals.

- Uncertain land tenure status, combined with frequent member turnover.

- Farm operation not geared to maximizing income, but rather to minimizing loss and obtaining a minimum income.

- Dependence on GOH agencies. ARG groups seem to consider themselves GOH employees tending a farm. Fideicomiso[1] loans reinforce this attitude by strict supervision of loans disbursed in installments to cover labor costs of the borrowers.

These and other factors contribute to the ARG farms emphasis on short-term goals and a maximum benefit with minimum cost strategy. Long-term investments are rare. All of these factors contribute to an unlikely committment by ARG to assume the costs of irrigation system construction and maintenance and operation.

GOH policy clarification toward ARGs is needed to formulate co ; recovery plans for the irrigation systems. Since this policy determination is too complex and politically delicate, it is unlikely to take place. An alternative and practical strategy might be to declare irrigation systems state property in the case of ARG farms and for the State to operate and maintain them, charging the ARG realistic fees. These fees could be deducted from loans using Fideicomiso procedures, which are widely accepted and used.

As with individual users of irrigation systems, the economic and financial viability of the farm operation is the principal criteria for irrigation efficiency and cost recovery.

(1) Fideicomiso: trust fund

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3. Shared Irrigation Systems

Irrigation systems shared by more tnan one user require a mechanism and/or some form of organization to allocate the costs and benefits of the system among the users. Users of a collective irrigation system are brought together to share a common problem and interest not necessarily by choice but by technical and economic considerations for the rational use of water resources. In any given area, served by one irrigation system, there are likely to be found a highly heterogeneous group of users. Existing systems in Honduras can be used to elaborate the types of user combination possible and the types of organizational requirements likely to be needed in systems to be developed by the Project.

There is no reason why shared or collective system should be treated preferentially in terms of construction and operation and maintenance cost recovery. The systems to be promoted by the Project are relatively small and will not demand the expenses of large irrigation systems. However, cost construction recovery feasibility for shared systems is to be determined by economic and financial analysis. Where feasible, users should be expected to cover construction costs just as owners of single user systems do. If not feasible, it becomes a policy question as to strategies for cost recovery. If GOH subsidizes shared systems, similar considerations should be given to individual users to avoid unfair and unequal treatment.

Operation and maintenance should be fully covered by the users. It is in this area that organizational factors can facilitate or prevent the expected collective action by the users.

Based on existing experience, the following user mix of collective systems can be foreseen:

- Independent farmers sharing a system. Example: Quebrada Seca in Guayape with a system under construction.
- Agrarian Reform Groups farming individual parcels. Example: Palmerola in Comayagua.
- More than one ARG farming collectively and/or individually. Example: La Herradura and Pusunca in Guayape.

Given the patterns of land distribution in Honduras, every irrigation site will produce a different combination of the above user mix possibilities. The most frequent is likely to be independent farmers and ARGs sharing one system.

The number of system users and the supply of water will determine the need and type of organization needed, as well as the degree of assistance in the formation of the organization.

4. Irrigation Committee

In systems with few users (less than five), an irrigation committee and a formally signed contract among users might be sufficient. In the contract, elaborated with Project assistance, all rights and obligations as well as the method for sharings costs and benefits should be spelled out. The users may assign themselves specific roles in the operation and maintenance of the system. The users should have ownership shares in the system, which they can sell if they sell their farm.

5. Water Users Association

In a system with more than five users (five is a tentative figure), there may be a need to form a Water Users Association. The Association members will be the owners of the proportional shares of the system. The Association will be responsible for the operation and maintenance with initial assistance from the Project. The Association members should also sign contracts specifying rights and obligations and distribution of costs and benefits. The Association must have authority to enforce the contract.

As a rule, the Association should be a specialized agency or institution dealing only with the irrigation system ownership and operation and maintenance. The reason for this is that in most cases water use will be the only common interest of the users at least initially. However, where advisable, the Association may be turned into a more comprehensive organization providing other services to the users. This should be decided by the users themselves, after they have shown their capacity to operate and maintain the system and feel a need for other services.

Distribution of costs and benefits in shared systems should seek two goals: 1) economic and physical efficiency of the system, and 2) equity. Honduras has had a long and arduous experience with collective farms in the Agrarian Reform Sector which provides, not only lessons in the problems of collective action, but also widely accepted and disseminated concepts of cost benefit distribution among members of collectives.

Issues of cost/benefit distribution should be prominent topics of discussion between the potential clients of a system and Project technicians during the identification and design stages. By the time construction begins, all future system users should have agreed and signed a contract on equitable principles of cost/benefit distribution and on the rights and obligations of every user in the operation and maintenance of the system.

It will be easier to build strong water user associations if the initial terms and conditions are well known to everyone and have been elaborated by users and Project staff before any construction begins. The text of these terms and conditions should begin with a required user contribution to design and construction costs. This contribution can be flexible and adapted to each case. In some cases, users may decide to build the system themselves (example, Quebrada Seca in Guayape), soliciting only technical assistance from the Project. In all cases, the Project should set a minimum users contribution of at least ten percent of costs at the outset.

In irrigation sites, with highly heterogeneous users, the Project needs to explore with the users, mechanisms to ensure that the rights of the more disadvantaged farmers enjoy protection by an outside governmental agency, such as the DRH which should supervise such systems.

Finally, one of the consequences of the cost recovery emphasis should be considered. Proportional cost/benefit sharing will not permit any mechanism for wealth redistribution since, for it to be a feasible strategy, proportionality is necessary. Large sized farmers will not only contribute more to costs than farmers with small farms, but will also benefit more.

One possible strategy to achieve some wealth redistribution, that deserves consideration, is to require equal cost contribution by all users and equal shares in the benefits (that is, equal shares to the water). Farmers with small farms with initial disproportionate costs, would be in position to sell that part of the share of the water in excess of their needs and thus benefit in the long run. Farmers with small size farms and excess labor may be willing to invest that labor in the system if it translates into long-term monetary benefits.

C. WOMEN'S ROLE IN WATER USER GROUPS

Review Question 3. Examine the extent of women's participation and their role in Water Use Groups, and develop approaches to ensure that women are not marginalized as a result of the creation of such groups.

In the existing water users groups visited, there were cases of women working in the farms, especially in the Agrarian Reform Groups farming collectively. For ARGs, which formerly excluded women from farm production except at harvest or weeding times when they were used as unpaid extra labor, it is a new development. It is the result of two things: the increased labor needs brought about by irrigated agriculture, and the promotion of women's issues in the country.

Since the Project will be promoting irrigation system is new and heterogeneous users in many different regions of the country, the issue of women's issues and participation in farm production activities should be integrated in the promotional and training packages to be used by the project.

The Project should study, together with the future clients, the possibility of naming young women from among the users' family or group, as water use specialists who would take the training courses to be offered and work for the AGR group or the Water User Association. Establishing new roles for women entering the work force may be easier than changing the long established and firmly entrenched division of labor in the peasant family, that relegates women to the domestic domain, excluding them from farm production decisions and activities. Where women are the heads of the farm, they will, of course, be included, in the management of the systems.

D. CRITICAL CONSTRAINTS

Review Question 5. Identify critical social constraints to farmer participation in an irrigation system effort and develop Project strategies to overcome these constraints.

1. Irrigation Systems Imposed on Unprepared and Unwilling Farmers

Many of the past failed irrigation systems seem to have been imposed on farmers by over-eager technicians who saw the great potential of irrigated agriculture that the farmers were not aware of, capable of, or even interested in.

Currently, the emphasis in DRH irrigation system development strongly emphasizes farmers' "participation" and a "learning process approach", particularly in the Small Irrigation System Program. The Project should build on this experience by systematizing it, and specially by training trechnicians who will work at the community level in those approaches.

Despite this positive development, the danger that systems will be imposed through strong persuasion remains. The Project should emphasize a response-to-demand strategy. It should also develop a study to establish irrigation needs among the potential clients beyond the simple question of: do you need irrigation? Market involvement, production crop cycles, climatic needs, migratory patterns, etc. could be some of the "need" indicators in addition to strong farmer demand and willingness to bear some identification and design costs.

2. Conflict History Among Potential Users of Proposed Systems

Potential users of a collective system may have a long history of conflict and hostility. Conflicts may have originated through the Agrarian Reform process or may involve local politics, farmer

organization affiliation, etc. The Project should assess the likelihood that the potential users will cooperate in an irrigation effort.

3. Abrupt Change in Crop Production and Lack of Market

Perhaps one of the most critical constraints to farmer involvement in an irrigation effort is the problem of markets. Adoption of new crops without marketing channels may leave farmers with unsold crops and local entrepreneurs unable to handle the sudden supply of unaccustomed crops.

The Project should seek to involve contract farming where possible at least at the initial stages of system operation and new crop production. Contract farming offers farmers an incentive to produce, and assurance that the new crops will be sold.

Where contract farming is not feasible, the Project should explore the possibility of technical assistance and credit to local marketing entrepreneurs as a means to not only assist farmers but to make local entrepreneurs more efficient and competitive. An alternative is the gradual introduction of new crops leaving time for spontaneous adjustment in the local marketing system.

Farmer organizations such as cooperatives should be carefully reviewed in all cases. Where users are coming together for the first time as a result of the irrigation system, such organizations should be avoided unless the farmers take the initiative.

4. Irrigation System Conflict Management

Hopefully, each association of water users will be strong enough to be able to manage conflict among users. However, given the possible heterogeneous composition of many irrigation systems a back up mechanism of conflict resolution may be needed. The DRH could be the institution charged with this responsibility and should be

provided with enough authority to impose sanctions if necessary. Irrigation systems can hardly afford desertion of users.

5. Debt Burden

Careful analysis of the current debt burden of potential users should be undertaken in the initial stages of project selection and identification. This should be mandatory for ARGs. The irrigation system may allow many users to increase production and meet past as well as present obligations incurred with the system. The opposite may also be true. The new obligations may add to an already heavy debt burden and eliminate any chances of cost recovery. A large number of ARGs may have debts incurred by previous members no longer in the group, or may have debts due to crop loss. Therefore, there is need for a past debt history analysis to assess group credit carrying capacity and participation in the irrigation effort.

A related issue and potential critical constraint may be the current group activities and debt obligations incurred for projects such as building houses, acquiring farm machinery, etc. Some groups may be so overextended in terms of other current projects that they will be unable to assume yet another project.

E. ANTICIPATED IRRIGATION IMPACTS

Review Question 4. Analysis of potential impact of technological change related to the provision of the irrigation on small and medium sized farm units, with special emphasis on: ability to adopt and effectively utilize systems; impact on division of labor with the family farm; impact of the role of women; and anticipated changes in the farm system as a result of irrigation.

1. Adoption of Irrigated Agriculture Technology

There is a widespread belief that farmers in Honduras do not know that irrigation is good for them. Therefore, the first task is to persuade them into wanting an irrigation system. Associated to this belief is the expectation, on the part of agricultural technicians, that once irrigation has been introduced, farmers must realize the full potential of irrigated agriculture instantaneously.

It is suggested that farmers generally know what is "economically good" for them, and that their activities, before and after an irrigation system is constructed, respond to economic incentives. Adoption of irrigated agriculture is therefore decided by the farmer on the basis of the economic alternatives he/she currently has. Farmers interviewed were unanimous in their preference for the gradual shift to irrigated agriculture. They were also aware that irrigated agriculture offered a significant potential for increasing production and incomes.

Farmers' conservative attitude is related to the need not only to learn the new techniques to produce new crops with water, but also to finding markets for the new crops. Markets are perhaps the critical factor in the adoption of the new technology. A new market cooperative or similar institution, where none existed before and which has no track record, only adds to the uncertainty. Use of old and established marketing channels if these are able and ready to

take the new crops, or contract farming are better alternatives.

A second major farmer concern is the timing needed to restructure yearly activities. Expectation that farmers, who only cultivate during the rainy season, will start immediate year-round cultivation with an irrigation system is unrealistic in most cases. Farmer economic activities during the off season agricultural season may be crucial sources of revenue and of added security, since this income may be derived from work outside agriculture and be independent of the risk associated with agriculture.

To overcome this problem, there is a tendency to provide "integrated" assistance packages which hope to address every known possible problem. While this strategy is a viable one, the unintended effect is to create a climate of unbearable risk for the farmer who becomes totally dependent on a project that attempts to change whole socio-economic systems and over which he/she has little control. The farmer, based on his past experience with such projects, knows that they may disappear as mysteriously as they appeared. Thus, lowered expectations and sufficient adjustment time, as well as flexibility, may in the long term allow the farmers sustainable adoption of irrigated agriculture.

2. Labor Requirements

Farms below 5 hectares in size have sufficient labor resources to absorb most needs brought about by the introduction of irrigated agriculture. The potential problem with this type of farm is conflicting demands for labor. It is likely that members of most family farms are employed off-farm to supplement farm incomes. Therefore, it is a question of trade-off in the use of family labor. Proximity to off-farm work as well as to urban centers will be important considerations for farmers in this size farms. If farm income is only a portion of family income, and marketing prospects for irrigated crops are good, the farmer is likely to employ labor rather than use family members or his own labor in the farm at least

initially. Once irrigated agriculture has been established and farm income increased, where family members employ their labor becomes a question of comparative advantage.

Small farms with no off-farm labor will greatly benefit from irrigated agriculture is higher labor needs. Family labor will, in most cases, satisfy any new need for extra work.

Farms above the 5 hectare size will generally employ hired labor to meet new needs. According to the already mentioned Diagnóstico Agropecuario of 1974, in farms between 5 and 35 hectares the second most important constraint was labor, especially at harvest time. (p.155) This situation will be considerably aggravated with the introduction of irrigation. Farms of this size may become important sources of employment for the rural landless population. Larger farms will experience even greater labor constraints and will employ significant numbers of new workers.

3. Role of Women

Increased labor demand in farms with irrigated agriculture offers an opportunity for women, especially young women whose alternatives are limited to the "traditional" role of the farmer's wife, or to migration to urban centers and domestic employment in urban homes. This development could be observed in ARGs farming collectively, where the young daughters of group members were working for pay alongside the men. In addition, agricultural related activities such as processing and packing plants are employing and could employ an even greater number of young women as more such facilities are created.

The advantages of irrigated agriculture are that it generates needs for new work roles hitherto not strongly associated with either sex. Packing and processing plants are an obvious example, however, work in the field increases to such an extent that women are readily accepted, since they do not directly compete with men.

4. Farm System: Agricultural Cycle

Under rainfed agriculture, the production season of most farms in Honduras is six to seven months long. The rest of the year, it is occupied in other activities which range from the general upkeep of farm instruments to migration for work elsewhere in the area, or the country.

The current farming system of most farmers in Honduras is well adapted to the needs of rainfed agriculture. A shift to year-round irrigated agriculture will involve considerable change and adjustment and will require time. For each specific site, the Project should require a brief description of the yearly cycle of activities and a realistic change plan in the current farm system.

TECHNICAL ASSISTANCE: SOCIAL SCIENTIST

Assistance in the social and human aspects of irrigation systems should focus on:

- The training of irrigation system design specialists and agricultural extension personnel on the social factors affecting system operation and maintenance as well as farm production. All project personnel should be conversant with basic social organizational concepts.

- The establishment of a participatory approach to site selection, project identification, and system construction. Mechanisms for interaction between clients and technical personnel should be clearly established and technical personnel should discuss with clients all decisions.

- The development of social pre-feasibility study to select appropriate sites, clients, and forms of water user organization. Social feasibility should be established after or concurrently with technical and economic site identification.

- The development of a process, through all system design, construction, and initial operation and maintenance stages, oriented to the goal of organized users assuming full responsibility for the system. This process should be based on economic efficiency and equity principles.

- The development of a process for system monitoring and feedback oriented to on-course adjustments and to social impact assessment. This will include baseline data for each site and a continous process to monitor and evaluate development.

Social science participation should be used to train and assist agricultural extension personnel in dealing with the clients and in forming water user organizations.

The role of the social scientist should be one of diagnosis, assessment, and monitoring. It should be an advisory role to technical people and to the field extension agent (who will be an agronomist). The temptation to discharge all social and organizational problems on a low level community promotor without a voice in technical decisions, (who is dispatched to problem sites after the problem has emerged), should be avoided. Field technical personnel, with the assistance of the social science staff, should deal with the people as well as the crops and the use of water. The strategy should be problem prevention, and not after the fact problem repair.

The following outside technical assistance is recommended:

One social scientist, preferable an anthropologist, with considerable experience in irrigation systems, in social feasibility studies, and in evaluation and monitoring work.

One year (the initial year) to set up together with a national counterpart the methods and processes to be followed in site selection, design construction, and initial operation and maintenance stages. Early in the year, the social scientist should develop courses to be offered to other technical personnel.

Following the first year, a social scientist should be brought in for a period of three months a year to monitor and evaluate the development of the Project. This work should include case studies of specific sites to be included in the training courses for all Project personnel.

Qualifications:

A master's degree or higher in Anthropology or Rural Sociology with a minimum of six years of experience in development work, including experience in: development, evaluation, and/or implementation of irrigation projects; rural farmer organizations; and ample experience in Latin America. A rating of S-4, S-4 in Spanish is required.

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April 3, 1986

TO: William G. Kaschak, ADMD

THROUGH: Richard L. Owens, O/RD

FROM: William Shimasaki
Experience, Inc. Review Team

SUBJECT: Irrigation Design and Construction

Attached is a review of recommended criteria for the selection, implementation and operation and maintenance of proposed small, medium and large size irrigation systems in Honduras.

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IRRIGATION DESIGN

By: William Shimasaki

Task I Technical Selection Criteria for Different Types of Systems

A. Make Soils Studies for:

1. Agricultural suitability: fertility, pH slope, etc.
2. Engineering suitability: permeability, compaction suitability, bearing capacity, sand and gravel sources, etc. Most of these tests require a soils testing lab.

B. Check Topographical Suitability

Slope of land, topographic irregularities that preclude leveling, drainage. This must be done during the dry season.

C. Check Adequacy and Suitability of Water Source

Various crops have different plant/water needs that will have to be studied and defined by an agronomist. Water availability to the plant is influenced by many factors such as rainfall, evapo-transpiration, infiltration into the soil, etc. If efficiently used on a 24 hour basis, a global average of 1 liter per second delivered at the farmer's head gate will generally support 1 hectare of plantings. Conveyance canal losses and farmer usage inefficiency must be added to arrive at the water rate required at the source. With direct pumping and a short discharge pipe, practically no losses are incurred for the delivery system to the canal. Under the circumstances observed and until further efficiency can be attained, the rate at the source should be calculated at 3 to 4 liters per second per hectare, depending on the length of the canal and conveyance losses. With experience, it should be

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possible to reduce this rate to about one half, thereby doubling the land that could be served.

Water requirements for an efficiently managed drip irrigation system will require only a fraction of the amounts needed by any other method of irrigation. Although the initial installation cost is considerably higher, the shortened time to full production may well prove the drip irrigation system to be economically feasible. With tree crops, the time to full production could be shortened to half the normal time.

D. Global Cost Estimate for Construction, Unit Costs

Rehabilitation	1000-3000 L/ha.
New, including leveling and concrete canals	3000-8000 L/ha.
Total Construction needs, (est.)	$12,000,000 US
Additional funds for studies	
Various small to medium projects	$500,000 US
Nacaome Project	$2,500,000 US
Total	$15,000,000 US

See page 4 of "Implementation Strategy" by Wesselmann for details of Personnel Needs.

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Task II Technical Guidelines for Design and Construction of Various Types of Irrigation Systems

The requirements for construction for any type of irrigation system are basically the same and include the following:

1. Personnel

The district engineer and one full-time inspector will suffice for the design and construction of small projects up to and including 30 na. For larger projects, an engineer should be assigned to each construction project with several full-time engineers monitoring concrete quality, and soil compaction. The expatriate engineer and his counterpart should make frequent field visits to assure time, cost and quality control.

2. Materials

a. Tests must be made to ascertain if the soils used for embankments are compactable.

b. The soils must have acceptable limits of infiltration (leakage).

c. Sand and gravel sources must be located and tested for suitability.

d. The proper type of cement must be ascertained and sources must be located.

3. Equipment

a. In small projects to be executed by the district DRH, a small 1 sack concrete mixer with a skip loader is recommended.

b. In larger projects where the work is to be contracted, the contract should be thoroughly reviewed for compliance to acceptable technical and contracting norms.

c. The capability of the contractor must be assessed in terms of qualified personnel and equipment.

d. The adequacy of the pumps and tubing if sprinkler irrigation is contemplated should be reviewed.

4. Methods of Construction

a) In micro systems the cost of the installations may be the controlling factor for implementation because of the very small total return. This may be somewhat overcome by the production of high value crops.

b) In small and medium sized systems a longer term financing plan could be contemplated with a longer payback period. This may include concrete lined canals and more sophisticated systems such as sprinkling and/or drip irrigation systems.

c) Large irrigation systems of over 1,000 hectares clearly need more financing for the construction of dams, reservoirs and more sophisticated distribution networks. Under these conditions, permanent tree and fruit crops and large areas of cotton and sesame production could be planned.

5. For emergencies in cases of a breakdown of a pumping system, it is recommended that a 4" pump and motor mounted on a trailer as an integrated unit complete with suction hose and foot valve be purchased for each district. (Estimated cost - US$7,500)

Checklist for Construction by Type of System

There are various types of irrigation systems as shown in other sections of this report but, except for the type of equipment needed, the requirements to be considered are basically the same and include the following:

Checklist of General Factors

1. Was the irrigation project initiated by to a request from the users and not imposed upon the potential users "because it is good for you"?

2. Are the farmers aware of the added duties and responsibilities of a new type of farming that they are going to undertake?

3. Has a method of allocation of water and maintenance been formulated?

4. Have methods for the recovery of the costs of construction, operation and maintenance and water charges been determined?

5. Has a study been made for the marketability of the proposed production?

6. Has an environmental impact study been made for assurance that there will be no adverse results from the project, that is, proliferation of water contamination, malaria, silting, etc.? If there are any potential adverse effects, have means for prevention or minimization of these effects been formulated?

7. Has water quality been examined for salt content to prevent salinization of the project?

Checklist of Technical Factors for Construction

1. Has the availability of the water source been investigated such as:

   a. Is the source sufficient during the dry season?
   b. Have rights of other prior or subsequent users for such purposes as generation of power and municipal water supplies been considered?

2. In the case of gravity diversions, is the intake protected against floods inundating the project and have adequate overflow provisions been made to mitigate the effects of floods.

3. Is there a method of control at the intake (control gate)?

4. Is there a plan for water allocation such as the "rotation" method, "demand" system, etc. and adequate means of enforcement of the water allocation plan.?

5. In the case of pumping from ground wells, is there approval from the appropriate government agency to withdraw water from the ground?

6. Have the plant/water requirements been studied in order to determine the water requirements (and therefore the sizing) of the canal?

7. If delivery canals are to be constructed, are the soils compactable or can they be made so at a reasonable price?

8. If not compactable (high sand and/or gravel content), has the economic feasibility of the following alternatives been considered:

   a. Replacing the unsuitable material with compactable soils?
   b. Lining the canal with plastic or concrete?
   c. Using a pipe system

9. If the fields are to be leveled for row or flood irrigation:

   a. Will there be heavy cuts where the fertile topsoil is lost and infertile subsoil is exposed?
   b. Has stockpiling of the topsoil been considered and later redistributed in the area of the heavy cuts?
   c. Has planning been done for re-leveling every year for the first three or four years to rectify settlement in areas of fill?
   d. In cases of flood irrigation, are there adequate plans for wet leveling or "puddling"?

10. In cases of pump irrigation, are the pumps, motors and piping adequately sized for the project for the proposed plant/water requirements and the application methods (hours of application, method of application, flood, row, sprinkler or drip irrigation)?

11. Have adequate provisions been made to prevent erosion in the case of earth canals?

12. Have adequate "drop structures" been used in cases of excessive fall?

13. In any project with multiple users, have lockable delivery gates been planned to control amounts and timing of water to the individual users?

14. Have most economical length of "run" of furrows been determined for the slope and the soils?

15. Has it been determined who will be responsible for operating the delivery gates: a users association, a cooperative or a government agency? Whoever the entity, they must have the authority to enforce the schedule.

16. In cases of row irrigation, have adequate means for disposal of excess tail water been provided to prevent flooding and water logging?

17. Are wasteways provided at predetermined locations and ends of canals and laterals to prevent washouts due to usage errors or sudden rain storms?

18. Are wasteways graded so that there are no ponds and/or lagoons formed thereby increasing the incidence of malaria and other water bourne diseases?

19. Have adequate provisions been made for maintenance of the systems by:

    a. The users contributing the labor to perform the work.
    b. Contracting a private company to do this work to be paid by the users.
    c. Requesting the government (DRH) to do the work, the cost to be paid by the users.

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Task III GOH and Private Sector Engineering Technical and Administrative Capability Evaluation

All of the GOH personnel contacted are academically well qualified in their fields of expertise. It appears that additional training and refreshing of their technical training would be very worth while for the field personnel. In almost all cases except for those technical personnel in administrative positions, the actual "hands on" field experience can be profitably expanded. The new project will give ample opportunities to gain this field experience under actual production conditions. For this, it is recommended that thoroughly experienced expatriate experts be provided to advise the GOH personnel.

Private Sector Construction Capabilities

There are sufficient numbers of contractors that are willing to undertake irrigation construction jobs. However, there are very few experienced in irrigation construction or who have specialized irrigation construction equipment. Most contractors have heavy construction, building and road construction expertise and equipment.

For irrigation systems they will need to purchase some specialized equipment such as small vibrating rollers, ditching and concrete lining machines for the larger jobs. Also they would do well to hire a field engineer with adequate experience in the construction of Water Delivery Systems preferably in Latin American countries.

Annex A

JOB DESCRIPTION

IRRIGATION AND WATER MANAGEMENT ENGINEER

Duties

1. He shall respond to any requests for information or assistance in his field of expertise from the Chief of Party of the Project.

2. He shall advise and assist his counterpart in the following fields of expertise to:

   a. Review and advise the District Engineer and agronomist in the study and implementation of all repairs and/or rehabilitation of existing works.
   b. Review and advise the District Offices on plans and specifications for irrigation projects.
   c. Advise the District Offices on construction quality and procedures to increase the irrigating efficiency through reducing water seepage losses.
   d. Advise the farmers and Users Associations on various kinds of water delivery control systems.
   e. Collaborate with the agronomist to select the best methods, amounts and timing of water application for various crops.
   f. Assist in making suitability decisions for materials and methods to be used in the construction of, but not limited to:

      1. Compactability of construction soils
      2. Suitability and selection of sites for sand and gravel for construction.
      3. Efficient design of hydraulic structures.
      4. Methods of obtaining adequately compacted canal banks.
      5. Efficient methods, planning and implementation for lining small canals by hand.

6. Evaluation of the capability of contractors for the construction of Irrigation Systems.

g. Participate in making decisions on the type of irrigation system best suited to the particular project to be implemented.

h. Collaborate in making estimates of construction costs before implementation and to ascertain the actual costs after construction. He should assist in formulating a cost control system so that the final cost of each project can be quantified.

Qualifications

1. He should have a minimum of a Bachelor's Degree in Civil Engineering with a specialty in Hydraulics and/or Irrigation.

2. Have a minimum of 15 years of irrigation experience in irrigation planning, design, construction and operation and maintenance. At least half of this experience should be in developing countries.

3. He should have experience in various types of irrigation systems:

   a. Simple diversions
   b. Direct pumping
   c. Pumping from underground sources
   d. Furrow irrigation
   e. Flood irrigation
   f. Sprinkler irrigation
   g. Drip irrigation

4. He should have a minimum Spanish language capability of R-3, S-3 levels.

Prioritizing Project Implementation

After due consideration of all factors presented in Task I, "Technical Selection Criteria", the GOH should make its selection of projects and the priority for the implementation.

A sample program for Project Implementation is presented as a possible framework for implementation. The program is very general and the actual implementation plan will be formulated by the GOH.

Comayagua Region

It is expected that the "medium sized projects" will be a system of a secondary canal from an existing main canal (Selguapa or Flores) and tertiary canals furnishing irrigation water to many small farmers cultivating 1 to 10 hectares of land. An estimated distribution by size of farms may be:

	No. of Farms	Hectares
Up to 1 hectare	15	15
2 - 4 hectares	10	30
5 - 10 hectares	3	25
Over 10 hectares	2	30
	30 units	100 ha.

This area is particularly suited to early implementation because of the many farmers that already have irrigation experience for many years with the existing Selguape and Flores Projects.

The work will consist of some rehabilitation of the existing water delivery system for more efficient operation and to reduce water losses and for the extension of the irrigated lands. It is estimated that close to 50% efficiency improvement could result in comparable increase in productivity. While the main emphasis will be in the Selguapa District some similar sectors could be studied and possibly implemented in the Flores District.

At the same time that the secondary canal sector is being implemented, smaller systems of up to 10 hectares for from 5 to 15 small farmers, could be developed each year similar to the Palmerola project.

Choluteca Region

The large project being developed by the Japanese Government is located downstream from the town of Choluteca. Upstream from Choluteca are various farms that are now in operation. Production is mainly melons (cantaloupes, honeydews and other melons), chili, corn, watermelon, rice, sesame and other vegetables. The melons, chili and sesame are mainly for the export market while the others are mainly for domestic consumption. Cashew (marañón) is another very promising export crop possibility for this area.

The possibilities for some rehabilitation of existing small farms, the extension of the areas and opening new small farms of up to approximately 30 hectares appears to present many opportunities. According to DRH engineers there are some 35 hectares of small farms in the area which are now irrigated. Besides improvements and extensions that can be made to existing irrigated farms, there exists the potential for other new farm development to reach a total of 350 to 500 hectares in this area.

Juticalpa Region

There is a tremendous potential for irrigated agriculture in the Guayape Basin. CIDA, the Canadian Government Technical Assistance program has spent considerable funds in making a feasibility study of the whole basin with a potential of 95,000 ha. of which approximately 65,000 hectares can be irrigated by direct diversion from the Guayape River. A comprehensive ground water survey has also been made.

CIDA has completed studies and plans for the implementation of a 4,000 hectare development. Various pilot farms have been established by the Canadian government and the World Bank.

Until the last few years there has been very little irrigation activity in this area. With the exception of a few very small independent farmers, the results have been mediocre to poor. The farmer/user groups need better organization. There appears to be a shortage or lack of water user regulations. However, the DRH is taking more direct interest in the field of irrigated agriculture. The Guayape area with great potential will require considerable technical assistance input to the water users, including assistance in the formation of Water Users Associations, water usage regulations, irrigated culture practices and marketing.

With the infusion of some inputs to the on-going Canadian impetus, possibly as counterpart funds, it appears that considerable expansion of their activities would be possible. In conversations with the CIDA representative in Tegucigalpa, he indicated a good possibility of such an arrangement. For the immediate future, CIDA plans indicate a 400 hectare augmentation of their present program. Talks should be conducted with DRH and CIDA for possible expansion of their projects to add some 1500 hectares of irrigated farms within the 7-year life of the USAID project.

San Pedro Sula Region

Most of the country's irrigated development is in the North and the large projects are heavily invested in banana and sugar cane production for the export market. However, there are some small irrigated farms where rice and other crops are grown. Also, there are smaller farmers growing bananas and sugar cane who sell their products to the large processors. Some of these, especially under the Agrarian Reform program, are converting from the largely uneconomic crop of sugar cane to other crops. There exist opportunities for assistance in the development of this type of projects.

Also there are small independent farmer groups at La Lima, and Cooperativa Santa Isabel, where rehabilitation and repair work can be done and the present areas augmented by from 10 to 30 hectares.

Nacaome Region

Although the intensive review team did not have the opportunity to visit this area, the potential appears to be great. A pre-feasibility study has been made for this possible 6,000 ha. area irrigation project from the Nacaome River. However, a review of the Nacaome Pre-Feasibility Study should be made to study alternative development possibilities. The pre-feasibility studies envision three upstream storage reservoirs to retain and regulate flows for dry season use. Present use is mainly cotton farming but it appears to also have a good potential for cashews and sesame production for export.

Another possibility to be investigated in the lowland areas near the ocean is the production of highly salt tolerant crops such as alfalfa, asparagus and other crops in the lowlands close to the ocean.

In dry areas with irrigation where moisture to the plants can be strictly controlled, the viability of seed production should be studied for implementation.

Development of an Irrigation Project

I. Initiation - Request for help for an Irrigation System

An irrigation development project must begin with a request from the users. Without a request, the chance of a successful project is almost nil.

The request, whether from an individual, an association of a group of farmers or a cooperative, must be in writing and submitted to the District Engineer. This must be a petition signed by all parties concerned giving the amount of land to be irrigated, the probable source of water and the crops that they propose to grow.

II. Prioritizing Project Implementation

A list of priorities for the implementation of projects will be made by the DRH from the list of requests received in the various Districts. It is contemplated that several small projects and at least one medium sized project can be implemented in the first year in the Choluteca and Comayagua Districts for a total of approximately 80 hectares in each of the two districts. In the second year similar programs will be initiated in the North District and Juticalpa Districts for a total of about 100 hectares.

During the first year, planning shall be done for implementation of the second year's programs. This will take from one to six months for small projects and more for larger projects.

III Detailed Examination of Proposed Project

When a request is received, the District Engineer and his staff will make a preliminary on-site inspection to make a cursory examination for the following:

a. The feasibility of the water source;
b. The feasibility of the topography
c. The feasibility of the soils including fertility, infiltration rate, drainage, etc.
d. The willingness of the farmers to accept the responsibility of doing the construction themselves (in the case of micro and small farms) or be prepared to pay for or do the construction and operation and maintenance of the system including a water charge.
e. Make a cursory examination of the feasibility of growing the crops intended.

When this cursory examination is completed by the District Engineer (to be completed in not more than one month after receipt of the request) he will forward this to the DRH office in Tegucigalpa with his comments for detailed review and investigations. These investigations will be in-depth examinations of the same points stated above. Special emphasis will be given to the following:

a. The social feasibility of the farmers to take on the added responsibility of an irrigated farm responsibilities. (Sociologist Scientist).
b. The markets available for the proposed production (marketing specialist)
c. The environmental and sociological impact that the new project will have (sociologist and environmentalist).
d. The soil/plant water needs (agronomist).
e. The feasibility of the proposed method of irrigation:
   1. Small diversion and gravity
   2. Small diversion and piped under pressure.

3. Small, medium, or large projects from diversion or pumped from an open water source or from underground sources.

f. The construction of wasteways and drainage systems.

This phase may take from one month in the case of the micro and small systems to up to 6 months to one year in the case of larger projects.

Office planning can be done during the rainy season but surveying and construction usually must wait for the dry season.

Planning for Implementation

I. Pre-Implementation

a. Concurrent with the detailed examination of the various factors which will form the basis for the design of the system, an education and orientation program will be given to the farmers showing their involvement, duties, responsibilities, problems that may come up and the possible benefits. This may be in the form of meetings and video shows and may extend over one or two months.

b. Detailed soils tests for agricultural suitability (pH, fertility, water retention, capability, etc.) shall be made. In the major areas under consideration, these can be made at the District level.

c. Detailed soils tests for engineering qualities must be made. These include permeability, optimum moisture content for compaction, foundation bearing qualities, and suitable sources for sand and gravel for concrete.

d. A topographic survey of the project lands and maps must be made.

e. The lands must be classified into the various classes of soil suitability. The USDA standard soils classificaiton or other suitable classification can be used.

This phase can take from one month in the case of micro and small projects to six or more months in larger projects and may run wholly or partially concurrent with other work.

II. Implementation

a. As soon as field survey data starts coming in, the actual preliminary designs can be initiated. In the case of micro

projects of up to 5 hectares, the final design may take as little as one month or as much as six months or longer for larger projects, depending on the size and complexity of the project. The design for all projects will be carried out in the field offices with close monitoring and supervision by the main office engineers. The design will include general and technical specifications in detail for contracts.

b. Upon completion of the designs and specifications, a call for bids shall be published. See "Procurement Review" by Anderson for details of Contracting Procedures.

c. The Construction Supervision shall be done by the District level personnel with frequent monitoring by the Tegucigalpa engineer and his expatriate advisor.

III Farmer Education and Assistance

a. Farmer education and assistance is a continuous process. At the onset, the education and training program will acquaint the farmer with the realities of the project including his duties, rights and responsibilities. It is at this stage that the farmer must make a firm commitment on whether he wants to participate or not.

b. The education and assistance will continue during his choice of crops, methods of water management and application, cultivating practices, harvesting and marketing advised by the extension service and the agronomist. He will receive advice and help in pest control, fertilizer application and amounts needed and whatever other assistance and/or help required.

See "Extension/Training Review" by Wesselmann.

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BENEFICIARY PARTICIPATION

A Case Study in Laos

The difference in the user's attitude between those who were given a complete system and those who had an input was dramatically demonstrated in Laos in 1970 where the writer was engaged in small irrigation development. In those cases where the complete system was built for the users and the workers were paid to work on their own system, when repairs were needed, they petitioned USAID to "come fix your canal". They would do nothing unless they got paid for their labor to the point of drastically reducing production. In the projects where the users had an input, they would petition for USAID to "come help us repair our canal".

When a village or group of farmers wanted an irrigation system, they made a written request to their government. The request was discussed with USAID. A Ministry of Agriculture official and a USAID representative would visit the village and determine what they needed and what the users would contribute. They had to contribute all labor, borrow areas for earth fills and sand and gravel without charge. USAID provided the pump (donated by th British Government), the discharge pipes, cement, reinforcement steel, wood for forms and the technical assistance. The villagers provided all of the labor without charge. In this way, they had an investment in the project and pride of ownership. A free gift is valueless because if it becomes useless, they have not lost anything but are only back from where they started.

Sample Implementation Plan

Annex F

District	Comayagua		Choluteca		Juticalpa		San Pedro Sula		Nacaome			Totals		
Type	S	M	S	M	S	M	S	M	S	M	L	S	M	L
Year 1	1 @ 5 ha	1 @ 80 ha	4 @ 20 ha	5	Preparation		Preparation		Review of Pre-feasibility			25	80	
Year 2	1 @ 5 R	2 @ 50 100	4 @ 30	8	2 @ 10 20R		1 @ 5 5		Feasibility Plans			60	100	
Year 3	1 @ 10 R	2 @ 50 100 R	4 @ 10 40 EX	1 40 N	20 R	50 N	1 @ 15 15 R		1 @ 30 N	1 @ 100 N		115	290	
Year 4	1 @ 10 EX	2 @ 50 100 R	4 @ 10 40 EX	1 @ 50 50 N	20 R	100 N	1 @ 15	50 E	1 @	1 @ 150 N		70	450	
Year 5	1 @ 10 EX	2 @ 50 100 R	4 @ 10 40 EX	1 @ 100 100 N	20 E	250 N		100 E		200 N		70	750	
Year 6	1 @ 10 EX	100 R	4 @ 10 40 EX	1 @ 100 100 N	20 E	400 N		100 E			1 @ 700N	70	700	700
Year 7	1 @ 10 EX	1 @ 100 100 R	4 @ 10 50 EX	1 @ 100 100 N	20 E	600 N		200 E			1 @ 1,300 N	70	1,000	1,300
Total	60	680	250	390	120	1,400	25	450	30	440	2,000	480	3,370 5,850ha	2,000

R = Rehabilitation
Ex = Expansion
N = New

S = Small
M = Medium
L = Large

NOTE: In addition to the above, it has been reported that there are other small to medium sized projects under various stages of implementation. Some of these are ready to implement upon availability of funds. It is recommended that the DRH prepare a list of these projects with all pertinent details for early implementation.

Some examples are cited below:

Santa Anita, Departamento de Ocotepeque, diversion from Río Frío, 200 ha±, assured source of water, very fertile soil. Production: vegetables, rice, grains, watermelons. All studies and plans completed. Estimated total cost 700,000L to 800,000L. Requires 9km. of main canal. Development can be done in stages. Awaiting financing.

Cooperative Fátima, San Gerónimo, Departamento de Comayagua. No irrigation used at present. Presently being helped by PL 480 funds administered by FAO. Source of water adequate for 70 hectares. First stage could consist of 30-40 hectares. Problem cited is "administración de dinero". Plans practically completed. Probably should have quick review of plans, environmental impact, social acceptability and market accesibility before implementation.

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BIBLIOGRAPHY OF RELATED STUDIES

1. CIDA — Feasibility Plan for Guayape Basin

2. CIDA — Ground Water Study for Guayape Basin

3. --- — Study for the Repair of the Coyolar Dam and Rehabilitation of the Flores Project

4. JICA — Implementation Plan for a Dam and Irrigation for 24,600 Hectares in the Choluteca Basin

5. CLASS — Pre-feasibility Study for the Nacaome Basin

6. World Bank — Improving Irrigated Agriculture. Staff Working Papers No. 531

April 3, 1986

TO: William G. Kaschak, ADMD

THROUGH: Richard L. Owens, O/RD

FROM: Homero Silva, PhD
Experience, Inc. Review Team

SUBJECT: Environmental Considerations and Criteria Review

Attached is the subject review of recommended environmental criteria and training plan to be used by United States Agency for International Development (USAID) and the Directorate of Hydraulic Resources (DRH). Also attached are the results from the examination of potential health impacts, and the initial environmental assessment for the Irrigation Development Project.

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Task I Develop the environmental criteria to be used in the selection of irrigations systems to be constructed, and the criteria to be used in the monitoring process during actual construction and operation of the systems.

Environmental Criteria for the Selection of Irrigation Areas

Irrigation systems cause different impacts to soil, water, air, vegetation and animals. Those impacts can be beneficial or adverse. They are considered in the selection of irrigation systems to insure that projects are not only technically sound but also environmentally feasible.

To develop the environmental criteria, interviews were first held with people from different government and private agencies. The objective was to get a better idea of the legal situation, the manpower availability, and laboratory resources in Honduras.

These findings were taken into consideration to formulate a questionnaire which will be used in the pre-selection of projects. The questionnaire will help to rank all the potential projects in a certain area, in order to select those which are the most environmentally sound. A more elaborated environmental impact report must be conducted on those areas selected for final design, only if an adverse impact was predicted during the pre-selection.

The questionnaire is presented in Table 1. It contains 30 questions. Each question has two answers: Yes or No. If the answer is yes, a value of -1 is given to it. On the other hand, if the answer is no, a value of +1 is given to it. After all the questions are answered, all the values are added. A negative value means the adverse impacts exceed beneficial impacts. A positive value means the opposite. This value will be used in the ranking of projects.

Several environmental factors are considered in this questionnaire: geologic, soil, biotic community, watershed, airshed, land use, local and

regional planning. Each factor considers first the existing conditions relevant to the project site and then the impact the project may have. All sources of information from which the impact was determined are to be cited for each factor.

TABLE 1

QUESTIONNAIRE OF ENVIRONMENTAL FACTORS FOR THE RANKING OF IRRIGATION SYSTEMS

A. Geologic Factors

1. Is the site subject to geologic hazards (seismic, landslide or mudflow)?

Yes: ____ No: ____

2. Will the proposed project create a geologic hazard or increase the intensity of such hazard?

Yes: ____ No: ____

3. Has the site been officially designated as having preservation value, either natural (open space, unique biotic habitat, mineral resource, etc.) or cultural (prime cultural land, archaeologic, paleontologic, historic, etc.)?

Yes: ____ No: ____

B. Soil Factors

4. Is the site subject to soil hazards (slump, soil creep, subsidence, erosion, stream siltation, etc.)?

Yes: ____ No: ____

5. Will the project generate erosion or stream siltation?

Yes: ____ No: ____

C. Biotic Community Factors

6. Is the site subject to fire hazard from flammable brush, grass or trees?

Yes: ____ No: ____

7. Will the project generate any of the above hazards?

Yes: ____ No: ____

8. Are there any rare or endangered plant or animal species, historically important trees, or unique biotic habitat on site?

Yes: ____ No: ____

9. Will the project disturb any of the above environmental factors?

Yes: ____ No: ____

10. Is the site used as a nesting place for migrating fowl?

Yes: ____ No: ____

11. Will the project involve disturbance of a nesting area for migrating fowl?

Yes: ____ No: ____

D. Watershed Factors

12. Is the site located in a floodplain area?

Yes: ____ No: ____

13. Will the project be subject to damage from flooding?

Yes: ____ No: ____

14. Is there a source of public water on-site?

Yes: ____ No: ____

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15. Does the quality of water existing on-site meet water quality standards?

Yes: ____ No: ____

16. Will the project generate pollutants (human waste, toxic wastes, surface water runoff, etc.) that will seriously affect any on-site sources of water?

Yes: ____ No: ____

17. Will the project seriously interfere with the present rate of soil and subsurface percolation?

Yes: ____ No: ____

E. Airshed Factors

18. Does the present on-site air quality comply with applicable air quality standards?

Yes: ____ No: ____

19. Will the project generate pollutants (dust or smoke particulates, pesticides, etc.) that will seriously impact the present air quality on-site or the surrounding area?

Yes: ____ No: ____

20. Will any features of the project (trees, utility lines, soil, etc.) be exposed to hazardous high winds?

Yes: ____ No: ____

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F. Land Use Factors

21. Does the site have officially designated historic, archaeologic or paleontologic importance?

Yes: ____ No: ____

22. Will the project disturb any items of historic, archaeologic or paleontologic importance?

Yes: ____ No: ____

23. Has the site been officially designated as a scenic vista-point, or being located in a scenic corridor, along a scenic highway or having a unique aesthetic value?

Yes: ____ No: ____

24. Will the project conflict with any adopted scenic/aesthetic values?

Yes: ____ No: ____

G. Local/Regional Plan Factors

25. Does the proposed use of the site not conform to the adopted or proposed local general plan or any of its state mandated elements (land use, housing, circulation, open space, conservation, seismic safety, etc.)?

Yes: ____ No: ____

26. Does the project not conform with the established character of the surrounding area, set a precedent for similar projects not in character with the surrounding area or exceed projected growth rates for the area?

Yes: ____ No: ____

27. Are any of the public facilities (roads) or public utilities (electricity, water supply, sewage and storm drainage discharge lines) serving the site at or over capacity?

Yes: ____ No: ____

28. Will the project generate any demands that will cause a public facility or utility to reach or exceed its capacity?

Yes: ____ No: ____

29. Is or has the site been the subject of any public controversy resulting from environmental concerns?

Yes: ____ No: ____

30. Will the project or can the project be expected to generate any public controversy over environmental concerns?

Yes: ____ No: ____

Environmental Impact Report

A. Introduction

In case that a potential adverse impact be predicted to occur as a result of the construction or operation of the irrigation project, measures shall be provided to make sure that remedial actions are considered during the final design. To achieve that, an Environmental Impact Report (EIR) shall be prepared. Basically, an EIR should be divided into sections and subsections as shown in Table 2. This includes a discussion of existing environmental conditions and environmental impacts. The DRH selection committee should decide if the project is economically feasible and environmentally sound based on this EIR.

In the following paragraphs a more detailed discussion of each topic that should be covered in the EIR is made.

SECTION I: DESCRIPTION OF THE PROJECT

The description of the project shall contain the following information but should not supply extensive detail beyond that needed for evaluation and review of the environmental impact.

a. The precise location and boundaries of the proposed project shall be shown on a detailed map, preferably topographic. The location of the project shall also appear on a regional map.

b. A statement of the objective sought by the proposed project.

c. A general description of the project's technical, economic, and environmental characteristics, considering the principal engineering proposals and supporting public service facilities.

PRECISE LOCATION AND BOUNDARIES

Two maps are required. The first map to be included should be a regional map that identifies the proposed projects as well as its over-all, relative location.

The second map may be a large scale map which shows the proposed project's precise location and boundaries. This map should be topographic.

On both maps, well-known landmarks should be indicated in order to graphically locate the proposed project region and site.

STATEMENT OF OBJECTIVES

In order to identify the project's objectives, its purposes and developmental phases should be detailed. The action proposed and the project type shall be indicated in order to illustrate the project purpose. Once the project purpose has been identified, developmental phasing, if any, and their impacts should be detailed.

DESCRIPTION OF PROJECT CHARACTERISTICS

To adequately describe the project's characteristics, it is helpful to use a checklist similar to the one shown in Table 3.

Table 3

PROPOSED CONTENTS OF AN ENVIRONMENTAL IMPACT REPORT

Section I Description of the Project

a. Precise Location and Boundaries
b. Statement of Objectives
c. Description of Project Characteristics

Section II Description of the Environmental Setting

a. The Environment in the Project Vicinity
b. Related Projects

Section III Environmental Impact

a. Impact of the Proposed Action

Direct and Indirect Impacts

b. Adverse Effects

Adverse impacts; adverse impacts needing an alternative design; impact on aesthetics or human health

c. Mitigation Measures

Avoidable adverse impacts; alternative mitigation measures.

d. Alternatives to the Proposed Project

Reasonable alternatives; alternatives which reduce impacts.

e. The Relationship Between Short-Term Uses...and Long-Term Productivity

Cumulative and long-term effects; reasons why the district engineer believes the project is justified

f. Irreversible Changes

Irretrievable commitment of resources: primary and secondary impacts; environmental accidents.

g. The Growth Inducing Impact

Ways the project could foster growth; other projects that may encourage growth.

TABLE 3
A BASIC CHECKLIST FOR USE IN DESCRIBING AN IRRIGATION PROJECT

I Planning Activities
- A. Project Planning
  - 1. Site Design
    - a. Size
    - b. Channels
    - c. Impoundment
    - d. Intake Structure
    - e. Pumping Station
    - f. Access Roads
    - g. Drains
  - 2. Construction Design
    - a. Basic features
    - b. Special Construction Design Features
- B. Economics
  - 1. Basic Data
  - 2. Cost/Benefit Analysis

II Construction Activities
- A. Site Preparation
  - 1. Removal Action
  - 2. Grading
  - 3. Site Improvements
  - 4. Temporary Facilities
  - 5. Time Factors
- B. Construction Actions
  - 1. Structures
  - 2. System Installation
    - a. Impoundment
    - b. Pumping Station
    - c. Canals
    - d. Roads
    - e. Drains

III Operational Activities
- A. Consumption
  - 1. Water (gallons/month)
  - 2. Electricity (KWH/month)
  - 3. Gas (cubic feet/month)
- B. Discharge
  - 1. Solid Wastes (pounds/month)
  - 2. Liquid Wastes (gallons/month)
  - 3. Surface Water Run-off (cubic feet/year)
- C. Pollution Generated
  - 1. Air Pollution (tons/year)
  - 2. Water Pollution (p.p.m./year)
  - 3. Noise Pollution (d.b. max at peak hour)

SECTION II: DESCRIPTION OF THE ENVIRONMENTAL SETTING

An EIR must include a description of the environment in the vicinity of the project as it exists before commencement of the project, from both a local and regional perspective. Knowledge of the regional setting is critical to the assessment of environmental impacts. Special emphasis should be placed on environmental resources that are rare or unique to that region. Special reference to related projects, both public and private, both existent and planned, in the region should also be included, for purposes of examining the possible cumulative impact on such projects.

THE ENVIRONMENT IN THE PROJECT VICINITY

To adequately describe the environment in the vicinity of the proposed project, one can compile an inventory of the existing environmental phenomena, shown in Table 4.

Although topics contained within this table are not exhaustive, they are indicative of the type of information which might be incorporated into the description of existing environmental conditions. This inventory will provide a basis for a later comprehensive impact assessment. Additionally, such an inventory of existing conditions will later form a descriptive and analytic basis for approving or denying the project development.

TABLE 4

A BASIC CHECKLIST WHICH CAN BE USED TO COMPILE THE DESCRIPTION OF THE ENVIRONMENTAL SETTING

1. Basic land conditions
   a. Geologic conditions
      Major land formations (valleys, rivers)
      Geologic structures (sub-strate, etc.)
      Geologic resources (minerals, oil, etc.)
      Seismic hazards (faults, liquefaction, tidal wave, etc.)
      Slope stability and landslide potential
   b. Soil conditions
      Soil conservation service classification
      Hazard potential (erosion, subsidence or expansiveness)
      Natural drainage rate
      Subsoil permeability
      Runoff rate
      Effective depth (inches)
      Inherent fertility
      Suitability for method of sewage disposal

2. Biotic community conditions
   a. Plant
      General type and dominant species
      Densities and distributions
      Animal habitat value
      Historically important specimen
      Watershed value
      Man-introduced species
      Endangered species (location, distribution and condition)
      Fire potential (chaparral, grass, etc.)
      Timber value
      Specimen of scientific or aesthetic interest
   b. Animal
      General types/dominant species(mammal, fish, fowl, etc.)
      Densities and distributions
      Habitat (general)
      Migratory species
      Game species
      Man-introduced species
      Endangered species
      Commercially valued species

3. Watershed conditions
   Water quality (ground water and surface water)
   Sources of public or private water supply on-site
   Watershed importance (on-site and surrounding area)
   Flood plain importance (on-site and surrounding area)
   Water run-off rate
   Aquifer recharge rate

TABLE 4

A BASIC CHECKLIST WHICH CAN BE USED TO COMPILE THE DESCRIPTION OF THE ENVIRONMENTAL SETTING

Streamside conditions (habitat conditions and streamflow rate)
Location of wells, springs
Marshlands, lakes, ocean frontage importance

4. Airshed conditions
General climatic type
Air quality
Airshed importance
Wind hazard area (min/max speeds)
Odor levels
Rainfall (average)
Temperature (average highs and lows)
Prevailing winds (direction and intensity)
Fog conditions (hazard potential

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When describing land characteristics, it is important to focus specific attention on geologic and soil conditions if large grading operations and deep hillside cuts are anticipated as part of the site preparation. When describing the existing biotic community, it is important to identify rare or endangered plant and animal species. Description of the last topic, which deals with air and watershed conditions, should emphasize the quality of air and water.

Related Projects

Assessment of related projects must be done carefully, since it will become important in the third section of the EIR. More specifically, this assessment will form a basis upon which cumulative and long-term environmental impacts will be determined. For example, if demands on surrounding water sources are near capacity, that demanded by the proposed project may overburden those sources and may lead to adverse cumulative impacts. Furthermore, long-term adverse impacts may be realized if, for instance, the proposed project will add pollution to an already heavily polluted river.

SECTION III: ENVIRONMENTAL IMPACT

All phases of a project must be considered when evaluating its impact on the environment: planning, acquisition, development and operation.

Because of the importance and intricacy of this section, each subsection is presented and discussed separately below. Section III should concentrate on analysis of those impacts identified as significant in the pre-selection phase.

THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

Describe the direct and indirect impacts of the project on the environment, giving due consideration to both the short-term and long-term effects.

This description should include specifics of the area, the resources involved, physical changes, alterations to ecological systems and changes induced in population distribution, population concentration, the human use of the land and other aspects of the resource base such as water, scenic quality and public services.

Direct and Indirect Impacts

Identify the beneficial and adverse direct and indirect impacts. Provide a clear, concise and objective description, quantified where possible, of their direct impacts (resulting primarily from the project itself, e.g., precedent for other such projects in an area where no similar projects presently exist).

ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED

Describe any adverse impacts, including those which can be reduced to an insignificant level but not eliminated.

Adverse Impacts

Adverse impacts to be dealt with are of two types: potential adverse project impacts which could be reduced significantly but not eliminated; and those which cannot be reduced.

Adverse Impacts Needing an Alternative Design

Describe here the implication, i.e., effects of potential negative environmental impacts which cannot be eliminated unless an alternative design is imposed. Justification of the proposed project by the project designer must be presented. Such a justification must provide a rational explanation for the project and its approval even though adverse impacts would result. The following questions may be a helpful guide in providing the explanation: Why is the project being proposed? What environmental and economic trade-offs can be made? Are these trade-offs consistent with community goals, resident values and attitudes? What are the costs and benefits to the community?

Impacts on Aesthetics or Human Health

The following questions should be considered carefully and answered in detail in analyzing and describing impacts on aesthetics and human health. Aesthetically, will the project destroy scenic views, remove or disturb historically important trees, or have similar negative aesthetic impacts? Specific health considerations might be: How is the incidence of malaria and diarrhea? Will the project increase this incidence?

MITIGATION MEASURES PROPOSED TO MINIMIZE THE IMPACT

Describe avoidable adverse impacts and the measures proposed to minimize these impacts. This discussion shall include an identification of the acceptable levels to which such impacts will be reduced, and the basis upon which such levels were identified. Where alternative measures are available to mitigate an impact, each should be discussed and the basis for selecting one alternative should be identified.

Avoidable Adverse Impacts

Here, refer back to the adverse impacts defined previously in this section and describe relevant mitigation measures. Attention should be given to two considerations: first, include only those mitigation measures which would reduce project impacts without altering the project scope; second, specify if these measures will eliminate the effect of the impact. If it will not eliminate the impact but will reduce it to what might be considered an "acceptable" level, explain the basic logic used to determine what an "acceptable" level is.

Alternative Mitigation Measures

In addition to describing avoidable adverse impacts and mitigation measures, other feasible mitigation measures are to be identified. Each alternative should be identified along with reasons for not incorporating each alternative. It is suggested that each alternative mitigation measure be evaluated in a cost-benefit analysis.

ALTERNATIVES TO THE PROPOSED PROJECT

Describe reasonable alternatives to the project, or to the location of the project, which could feasibly attain the basic objectives of the project and why they were rejected in favor of the ultimate choice. The specific alternative of "no project" must also always be evaluated, along

with the impact. Describe alternatives capable of substantially reducing or eliminating any environmentally adverse impacts, even if these alternatives substantially impede the attainment of the project objectives, and are more costly.

There are four types of alternatives to the proposed project which can be included here:

- Alternative projects which share objectives similar to those of the proposed project;
- Alternative site locations;
- Alternative projects which serve different objectives; and
- The "no project" alternative.

Alternative projects which share similar objectives are defined here as those which propose a different project size than that already proposed. While land use intensity suggested by the proposed project should correspond to general and community plans, alternative plans explore land utilization at different intensities.

Alternative site locations which are available and suitable for development should also be identified. When locating alternative sites, identify those areas which would generate fewer adverse impacts than those detailed for the proposed project site.

Thirdly, point out alternative projects which serve different objectives from those of the project in order to illustrate the range of uses suited for the proposed site. Not only should these alternative plans correspond with community goals and policies, but they must also be economically feasible.

Lastly, the "no project" alternative along with its impact must be evaluated. By analyzing characteristics of the existing site conditions identified in the description of the environmental setting, one can

define beneficial and adverse environmental impacts resulting from not implementing the proposed project.

Alternatives Which Reduce Impacts

Alternative designs which may reduce adverse impacts associated with the proposed project must be considered. Alternative designs are defined here as those which alter the project's scope by changing the size, magnitude or objectives of development. Once alternative designs have been described, the proposed project must be evaluated with illustrated alternatives. If the proposed project cannot be favorably compared to available alternatives, it must be redesigned or rejected. In order to compare the project and alternatives, a matrix and a user guide have been included as Figure 1 and Table 5. Using this matrix as a basis for comparison, physical, social and economic benefits, costs and risks of the proposed project and its alternatives can be considered objectively.

Figure 1
Alternatives Comparison Matrix

PROPOSED PROJECT AND ALTERNATIVES / IMPACT AREA	ADVERSE										BENEFICIAL						
PROJECT PROPOSED																	
ALTERNATIVES DESIGN																	
ALTERNATIVES TYPE																	
DIFFERENT LOCATIONS																	
NO PROJECT																	

TABLE 4

INSTRUCTIONS FOR USE OF THE ALTERNATIVES COMPARISON MATRIX

Use of the matrix illustrated in Figure 1 involves the following steps:

Step 1: In the left hand vertical column, identify the project and list all available feasible alternatives.

Step 2: In the top horizontal column, list the adverse and beneficial impacts identified in the Initial Study and during the analysis of the Environmental Impacts of the Proposed Action performed in the previous section.

Step 3: Analyze the alternatives in the same manner as the project. Also, add to the top column those impacts that the alternatives will generate. The No Project alternative should be analyzed in terms of the impacts generated by maintenance of existing conditions.

Step 4: By direct comparison, identify the intensity of the impacts generated by the project and its alternatives. A useful designation to the decision maker would be to differentiate between the levels of significance in the following manner:

For significant adverse impacts, use a lower case 'a' for significant mitigatable impacts, i.e., those that can be reduced to an acceptable level. Use a capital 'A' for those not so reducible. Use 'i' for insignificant.

For significant beneficial impacts, differentiate by using a lower case 'b' for those impacts that will produce only a minor benefit. Use a capital 'B' for major benefits generated.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Describe the cumulative and long-term effect of the proposed project which adversely affect the state of the environment. Special attention should be given to impacts which narrow the range of beneficial uses of the environment or pose long-term risks to health and safety. In addition, the reasons why the proposed project is believed by the district engineer to be justified now rather than reserving an option for further alternatives should be explained.

Cumulative and Long-Term Effects

Project impacts which will affect both natural and man-made life systems, and those which pose long-term risks to health and safety, must be delineated here. When describing these effects, the following questions might be considered: Will soil eroding from grading operations cause stream siltation or damage to aquatic life? What are the possible uses of the site and in what ways will the project narrow these uses to eliminate future development options? Will toxic substances be discharged into river or oceanic resources? Will the project cause long-term air quality degradation?

Reasons Why the District Engineer Believes Project is Justified Now

Trade-offs between short-term uses and long-term losses should be analyzed together with those involving short-term losses and long-term uses. In order to specify these relationships, consider the reasons for project justification and for allocating public resources in order to develop the project. While justification should be also identified in other sections of the EIR, the reasons should be explored and interrelated here. Some questions allow such interrelations to be discussed: Is the Project's development justified because short and long-term gains outweigh losses? For what reasons should the project be built now rather than in future years? What gains or losses accrue by development now? Is there

data available to support these arguments? How do the beneficial and adverse impacts compare with one another?

IRREVERSIBLE CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

Uses of non-renewable resources during the initial and continued phase of the project may be irreversible, since a large commitment of such resources makes removal or non-use thereafter unlikely. Primary impacts and particularly secondary impacts (such as road improvements which provide access to non-accessible areas) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified.

Irretrievable Commitment of Resources

Those non-renewable resources committed to the project should be identified and analyzed here to assure that their consumption is warranted. Non-renewable resources are not only those related to labor and materials, but are also "the natural and cultural resources committed to loss or destruction." In short, common resources which can be identified are gas, oil, gravel, historically important trees, and the like which may be lost should the project be developed. Additionally, analysis of such non-renewable resource utilization should focus on whether commitment of land for the proposed project is justified and whether the land can ever be returned to a natural or original state once graded, filled, or utilized in a different manner. The key phrase to keep in mind is, "commitment of such resources makes removal or non-use thereafter unlikely.

Primary and Secondary Impacts

Here, primary and secondary impacts which commit future generations to use the land in a similar manner must be identified and interrelated with direct and indirect project impacts. For purposes of definition, in this context, primary impacts can be said to result from land-use conversions (forest land converted to agricultural, for example), while secondary impacts result essentially from the creation of infrastructures such as roads, sewage and treatment plants, power lines, etc. Once land is converted and infrastructures created, future generations are committed to the continuation of similar usage because of a need to reclaim public funds which were invested initially.

While primary and secondary impacts must be indicated, it is also important to include tertiary and quaternary impacts as they may occur. These later impacts are also indirect consequences of the project and are spin-offs from primary and secondary impacts. For example, if an irrigation system were built, a primary impact would include hiring people, some of whom would not be currently living in that community. By employing these people from outside the community, the new housing needed for accomodation would become a secondary impacts. An increase of sewage discharge into streams and subsequent degradation of water quality, would be come tertiary and quaternary impacts.

Environmental Accidents

Potential for a means of anticipating and preventing environmental accidents must be discussed here. Potential accidents could incude: pesticide spillage in a river, landslides resulting from grading operations, flood damage to projects built in a flood plains, and vegetation destruction by wild fires. When discussing the potential for accidents, include measures which can be taken to prevent or minimize occurrence.

THE GROWTH INDUCING IMPACT OF THE PROPOSED ACTION

Discuss the ways in which the proposed project could foster economic or population growth, either directly or indirectly, in the surrounding environment. Included in this are projects which could remove obstacles to population growth (a better water supply will reduce child mortality). Increases in the population may further tax existing community service facilities so consideration must be given to their impacts. Also discuss the characteristics of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental or of little significance to the environment.

Ways the Project Could Foster Growth

In evaluating population and economic growth inducements created by the project, is is important to determine if such growth will have direct or indirect, beneficial or adverse impacts. The nature of these impacts should be identified and the following questions considered. Does the project remove an obstacle to population growth? Does the proposed project set a precedent which may foreclose future options? Would the project set a trend of similar land use conversions in the region? Will increased employment and taxes be generated? Will public utilities be overloaded? Will people move in from within or from without the community? Will the economic growth offset costs of increased public service demand?

Other Projects That May Encourage Growth

The specific characteristics which should be assessed here focus on the spin-off activities resulting from the proposed project, that may encourage or facilitate construction of other similar projects - in essence, initiate or stimulate a "domino effect." By assessing these characteristics, one should be able to identify significant environmental effects resulting from the development of the project

and from other projects which are located in the same reg on. Such an assessment may also determine whether the community has effectively planned for future growth, and whether the community could support increased financial allocations for public services.

Task II Develop a training plan/guide for use by both the GOH and private engineering/construction firms related to the environmental criteria in No. 1 above.

To insure that irrigation sites considered under this project achieve the maximum economic benefit under a balanced environment, consciousness of environmental protection should be generated in decision-makers as well as campesinos.

To achieve that, a training plan for environmental protection should reach all of the people involved in irrigation systems:

1. Decisions makers
2. District Engineers
3. Medium Level Staff
4. Design Engineers
5. Extensionists
6. Campesinos

Decision makers should receive at least one day of training. It may be in Tegucigalpa and before the project is initiated. General concepts on ecology, environmental impacts of irrigation systems, environmental analysis techniques and design of irrigation systems shall be taught.

District engineers and medium level staff should receive at least two days training. This can be held in Tegucigalpa, before the project is initiated. They shall learn about ecology, environmental impacts of irrigation systems, environmental analysis techniques and design of irrigation systems.

Design engineers and extensionists should be trained for three months, two months of theory and one of practice, two hours a day. This training will be coordinated with the irrigation design courses taught at the Training Center for Agricultural Development (Centro de Entrenamiento de Desarrollo Agrícola) at Comayagua. This training should start as soon as possible. The topics that should be covered are environmental

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biology, ecology, water chemistry, hydrology, water supply, sanitation, air pollution, environmental geology, environmental impact of irrigation systems, environmental analyses techniques and environmental design of irrigation systems.

Campesinos will be trained by the Extensionists during the design period. They will be trained on health hazards from irrigation systems, hygiene and environmental protection.

A textbook and teaching material should be prepared prior to the start of training. The textbook should cover all topics described before. Teaching material will aid during the presentation of topics. At this time, it has not been decided between slides or videotapes. This will depend on the amount of funds allocated to this activity. This will speed up the exposition of materials and give more time for detailed discussion of topics.

Pamphlets with graphic illustration should be used to teach campesinos about pesticide and fertilizer application; operation and maintenance of intake structures, impoundments, channels and drains; hygiene and environmental protection.

An environmental specialist should be hired at the very start of the project. He will prepare the textbook and the teaching material. He also will coordinate all the different courses discussed above. If deemed necessary, local instructors will be hired to cover some of the basic topics. The environmental instructor should stay in Honduras at least 9 months the first year and 3 months the subsequent years, for a total of 24 months.

The environmental specialist should also help in the execution of the first environmental impact assessments. He shall have the following qualifications: Experience in less developed countries in the fields of environmental impacts, water supply, sanitation and design of irrigation

systems; R-4, S-4 level fluency in Spanish; teaching and short course organization experience.

Sampling and laboratory equipment should be acquired to perform physical chemical and biological analysis of water. Equipment needed for physical tests of soils is already available in CEDA.

The equipment that should be provided is for normal physical, chemical and bacteriological analysis such as pH, temperature, electric conductivity, dissolved oxygen, turbidity, total alkalinity, total hardness, calcium, magnesium, iron, manganese, nitrogen (all forms), phosphates (all forms), solids (all forms), biochemical oxygen demand (BOD), chemical oxygen demand (COD), chlorides, sulfates, and coliforms.

Laboratory and field apparatus that should be provide are as follows:

Laboratory: BOD tester, nitrogen digester, deionizer, BOD incubator, high temperature oven, refrigerator, microscope, incubator for bacteriological tests.

Portable: Water analysis kit, pH, conductivity, dissolved oxygen, turbidity, and temperature meters.

Equipment for more sophisticated analysis such as pesticides should not necessarily be provided to the CEDA, because this equipment is rather expensive to be used only for teaching purposes. This does not mean that pesticides are not going to be analyzed during the environmental evaluation. Funds will be better spent if this sophisticated equipment is provided to the Centro de Análisis de Suelos, Aguas y Plantas (Analysis Center for Soils, Water and Plants), Ministry of Natural Resources. This center has trained personnel to do all the required analysis for soils, water and plants. However, some of the personnel should receive some training on the use and interpretation of the gas chromatograph (pesticide analyzer). Most of the time, chemical companies include training with the purchase of gas chromatographs. Training should be held in Honduras, to get the most people trained.

Task III Examine potential health impacts of irrigation systems to determine if malaria and other water related diseases will become a problem in areas proposed for irrigation interventions

Irrigation systems have both beneficial and adverse impacts on health. When irrigation systems are not properly planned, designed, constructed and maintained, adverse impacts surpass beneficial ones. Adverse impacts on health are caused by biological and chemical factors; diseases vary from a simple diarrhea to terminal cancer.

Economic losses due to adverse impacts on health may vary from a few dollars to several thousand dollars. This reduces the already scarce monetary resources of "campesinos". Some studies (*) show that 93% of the population expend $0.50 to $1.00 three times a month on shots. Up to one third of the population expends money to receive daily shots for a period of two weeks a year; or has to live close to medical treatment centers for a period of 2 months a year. An average of $8.25 is spent each time medical treatment is received. Private services are the most expensive, being the most economic the ones provided by the Health Centers. Even in cases where medical treatment is received at home, the average cost is $2.25, being, for the most part, drugs (**).

Irrigation systems are not the only factors responsible for adverse impacts on health, hygienic practices also play a major role on it. It has been found that hygienic education plays a major role on the incidence of diarrhea. Rural families frequently are not conscious about diseases transmitted by insects and animals. They do not emphasize

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* Foff, Gretchen. "Vista Socio Cultural de la Salud Rural y la Entrega de Servicios de Salud. Mito y Realidad". Mayo, 1980. Tegucigalpa, D.C., Honduras. C.A.

** Banco Central de Honduras. "Informe Económico 1984". Departamento de Estudios Económicos. Tegucigalpa, D.C., Honduras, C.A.

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hand cleaning before meals, and animals are often present in the eating areas. There is lack of prevention measures among rural population.

Health services are sought only during sickness. Prevention measures for a healthy child are not usually observed. For example, after a radio message about boiling water to prevent diarrhea reached 100% of the rural population, only 1.8% followed this advice. Twenty percent of the families studied believe that water loses "vitamins and power" during boiling; 70% do not boil water because of laziness or because they do not want water to lose its taste. However, it is deemed that people do not accept the existence of organisms in water because they are not able to see them. Parents will give boiled water to a child when he is sick, but do not see any need when the child is healthy.

To better explain what has been stated before, further discussion of biological and chemical disease causing factors is presented in the next paragraphs:

Biological Disease Causing Factors

Biological disease causing factors are virus, bacteria, nematodes, etc. They proliferate because of changes in the ecological setting caused by the irrigation system. These diseases can be classified as water-related and non-water-related. Water related diseases are those where the infectious agent lives in water or needs an aqueous medium during a certain part of its life cycle. Non-water related diseases are those where the infectious agents does not need an aqueous medium.

The Ministry of Health has records of each disease treated in the health centers located around the country. Those records were analyzed and only those diseases related to agricultural practices were selected. They are shown in Table 6, "Disease Occurrence by Type and Area Related to Agricultural Practices".

TABLE 6

DISEASE OCCURRENCE BY TYPE AND AREA, RELATED TO AGRICULTURAL PRACTICES, 1985

Disease	Metropolitan*	Rural
Amoebiasis	6,899	4,978
Dengue	2	369
Bacillary Dysentery	116	262
Viral Encephalitis	0	0
Diarrhea	43,884	141,173
Typhoid	153	313
Paratyphoid	5	13
Infectious Hepatitis	546	1,096
Leishmaniasis	0	175
Malaria	296	27,036
Poliomyelitis	11	46
Rabies	0	5
Total	51,912	175,469

* Includes only Tegucigalpa

Source: "Boletín de Estadística e Información de la Salud", Departamento de Estadísticas de Salud, Ministerio de Salud.

Water Related Diseases

This group includes: amoebiasis, dengue, bacillary dysentery, viral encephalitis, diarrhea, typhoid, paratyphoid, infectious hepatitis, malaria and poliomyelitis.

Non-Water Related Diseases

Irrigation systems cause an imbalance within the ecosystem they are constructed in. The final result is a potential increase of selected animal species, especially rats, and the consequent hazard for transmission of diseases. The common non-water related diseases in rural areas of Honduras are leishmaniasis and rabies.

From the information in Table 1, it is possible to observe that diarrhea and malaria are the main diseases that occur in rural areas of Honduras. About 80% of the cases are diarrhea and 15.4% malaria cases. Because of that, both are discussed in deeper detail.

Diarrhea

The diarrhea situation in Honduras is of concern. It is estimated (*) that 2,000,000 cases of diarrhea per year occur in the age group 5 years or less. Each child incurs 2 to 5 episodes per year with an average of 3. The morbidity rate during 1983 was 219.4 per thousand children. Diarrhea is the top killer in children one year old or younger.

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* Organización Panamerican de la Salud/OMS. "Curso Gerencial Sobre Planificación y Administración del Programa Nacional de Enfermedad Diarréica." Washington, D.C., 1982.

** Dr. José Enrique Zelaya, et al "La Terapia de Rehidratación Oral. Evaluatión de la Experiencia en Honduras", Ministerio de Salud, Honduras, 1985.

Diarrhea is a syndrome of diverse etiology. Its common signs are loose fecal depositions, frequently accompanied with vomit and fever. It is a sympton of cholera, shigelosis, salmonellosis, amoebasis, giardasis and viral gastroenteritis. It can be also caused by Escherichia Colie and campylobacter cultures and intestinal helmynthes.

Irrigation systems on one hand reduce the amount of water available to communities located downstream of them. On the other hand, they increase the concentration of pollutants (chemical, physical and biological). The final result being an increase on the occurrence potential of water-borne diseases.

The potential for water borne diseases varies with the level of service for water supply and excreta disposal practices. Rural communities without a safe water supply source and without appropriate excreta disposal will be most prone to adverse health impacts. Even more, those communities with a source of supply but with inadequate treatments (virtually all the rural residents use water which is not disinfected) will also have an increase of diarrhea occurence.

According to CONSUPLANE 24.2% of the rural population has piped water, 51.3% has wells and 24.5% has no service. Also 44% have a safe disposal of excreta. This situation places in a very delicate condition the effort of improving the economic conditions of the rural population through the development of irrigations systems.

In a brief research conducted by the Health Centers around the nation, information on diarrhea occurence, source of water supply and excreta disposal practices was obtained. Data collected are shown in Table 2 "Diarrhea Occurrence in Children 5 Years Old or Younger, According to Water Supply and Excreta Disposal Practices". In this table, it is possible to observe no big difference between water supply source and percentage of children with diarrhea. Also, no big

difference exists between excreta disposal practices and percentage of children with diarrhea. This corroborates what has been stated before.

TABLE 2

DIARRHEA OCCURENCE IN CHILDREN 5 YEARS OLD OR YOUNGER, ACCORDING TO WATER SUPPLY AND EXCRETA DISPOSAL PRACTICES

Type of Service	Percentage %
Water Supply	
Patio connection and in-house service	18.8
Standpost	25.6
Well	20.6
Excreta Disposal	
Toilet	14.6
Latrine	21.4
None	22.0

Malaria

In rural Honduras, 15.4% of all water-related and non-water related diseases are malaria cases. This disease has a very high economic impact on rural areas because an infected campesino needs about three months to fully recover from malaria.

Irrigation systems have a potential to increase malaria occurrence in a rural area because water is essential for irrigation systems and for mosquito proliferation. A mosquito spends 8 to 10 days in water during its metamorphic cycle from egg to mosquito.

There are four potential areas for mosquito proliferation in irrigation systems: irrigation canals, land along canals, cultivated land and downstream from the cultivated area.

Mosquito problems exist on all of the irrigation canals, but a higher potential exists in the small irrigation distribution canals. Lack of maintenance by the user is the main factor. Potential mosquito proliferation exists when water flow is slow (less than 3 or 4 inches/sec), or canal walls are eroded or emerging plants are along the canal or transverse sections are irregular. Experience shows that the smaller the canal, the higher the probability for mosquito proliferation.

Water losses due to infiltration and cracks raise the groundwater level along the canal. Sometimes, groundwater rises and appears at natural or artificial low lands, forming pools. These pools along the canal are good sites for mosquito proliferation. Overflow of water due to poor management during water transportation and distribution and "borrow areas" also have a potential for mosquito proliferation.

Controlled and non-controlled flooding irrigation methods have a potential to form pools on the cultivated area and hence a potential for mosquito proliferation exists. Preventive measures do not exist

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for the non-controlled flooding irrigation. Furrow irrigation has less potential for mosquito proliferation than flooding, but drip irrigation, underground irrigation and sprinkler irrigation are better. Of great importance is the provision for a complete and rapid water drainage in the irrigated field and for a drying period which assures the destruction of larvae.

The actual design practice of irrigation systems is to insure that water leaves the cultivated field through a series of drains which generally discharge into a natural watercourse. In such cases, the designer need not give as much attention to prevention of the formation of pockets of water which serve as mosquito proliferation sites.

Chemical Disease Causing Factors

The agricultural chemicals that pose a major threat to the general health of the rural community are fertilizers and pesticides. Salts indirectly cause an adverse impact on health. Each group will be discussed in more detail in the following paragraphs:

Fertilizer

Fertilization is one of the few methods by which man can exert a major influence on the natural process governing plant growth. Fertilizers contain nitrogen, phosporus, and potassium. Nitrogen is the only one associated with health problems. Nitrogen in water is in the form of nitrites, nitrates and ammonia.

Nitrites are very toxic. If ingested in water or food they interfere with the oxygen carrying capacity of blood. Nitrites can also combine with other chemicals and cause cancer. Fortunately, nitrites in water and soil are readily converted to nitrates.

Nitrates are five to ten times less toxic than nitrites. It has been found that high concentrations of nitrates may cause

methemoglobinemia in infants. For this reason the U.S. Public Health Service Standards limit the nitrate content of drinkign water to 45 mg/l.

Ammonia can be converted to toxic nitrite by nitrobacters. Also, high levels of ammonia are toxic to fish.

Pesticides

A multitude of chemicals in the general category of pesticides are used in agriculture to control weeds (herbicides), insects (insecticides, miticides), nematodes (nematocides), fungi (fungicides), rodents (rodenticides) and other animals.

Pesticides can get into a person's system in four ways: by inhalation, by absorption through skin, by drinking water and by food ingestion. Campesinos are vulnerable in all four ways. Downstream inhabitants are exposed only to the last two ways.

Pesticides can cause intoxication and death when safety measures are not taken during handling and application of concentrated products. Pesticides, once in the body, are accumulated in tissues specially fatty tissues; consequently, they are stored in the liver where they interfere with its normal function. They are responsible for several forms of cancer: breast, liver, pancreas, brain, etc.

In Honduras, the most serious problems from the use of pesticides are the lack of use of protective equipment and the lack of training of the user on the use of pesticides. During field trips made to Juticalpa and Choluteca there were several instances of the application of pesticides to cultivated fields. Face masks, gloves and shoes were not consistently being used by the campesino while applying the chemical. In certain occasions, a campesino was bare-backed while carrying fumigation tanks on his back. He claimed to have headaches during evenings but nothing else. He expressed the

belief that he was "immune" to pesticides after several years of using it.

People living downstream from an irrigation system are exposed to pesticides by drinking water and consumption of agricultural products. A high chance for pesticide ingestion through drinking water by the rural population exists because many people get water from creeks and because the chance for pesticide contamination is much greater for surface water than for groundwater. (This is because pesticides tend to be absorbed by soil particles, which can be carried downstream from treated fields).

Cases of contamination of surface water by pesticides have been documented in Honduras (*). Water quality data showed that DDT, Dieldrin, Toxaphene, Methyl and Ethyl Parathion and Endrin were utilized heavily in cotton growing areas in Choluteca and Olancho.

Salts

Salts in moderate concentrations do not directly have an adverse impact on health, but indirectly they may have. On the other hand, salts in high concentrations interfere with the normal function of kidneys and cause high blood pressure.

All irrigation waters contain some amount of soluble salts, which are left in the irrigated system after pure water has been lost through evapotranspiration. For example, if 1 acre-ft (1,233M^3) of irrigation water having 200 mg/l of salt is applied to 1 acre (4,047M^2) of soil, approximately 0.3 ton (272.2 kg) of salt will be left behind. If these salts are not leached out by regularly applying more irrigation water than needed for evapotranspiration, salts accumulate in the root zone and the land eventually becomes

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* ICAITI, 1976, "Estudio de las Consecuencias Ambientales y Económicas del Uso de Plaguicidas en la Producción de Algodón de Centroamérica", Guatemala

too salty for agriculture. Leaching occurs in most surface irrigation systems. It is estimated that 30 to 50% of the irrigation water becomes deep-percolation water. Deep-percolation water from irrigation systems often is the main cause of quality degradation of underlying groundwater. Degraded groundwater leads campesinos to use unsafe surface water for domestic consumption.

INITIAL ENVIRONMENTAL ASSESSMENT
FOR THE
IRRIGATION DEVELOPMENT PROJECT

PART I

Description of the Project

The project's purpose is to enhance farmer productivity and production through the installation of irrigation systems and the provision of related improved agricultural practices. These innovations will support the joint USAID/Honduras effort to diversify production thereby increasing domestic food supplies and agricultural exports.

The project will consist of two closely related components - the design and installation of irrigation systems and development of the institutional capacity to plan and execute irrigation interventions.

The project will be targeted to benefit the small and medium farmer population of Honduras. Numerically, this group is dominated by growers with postage stamp holdings (less than 5 hectares) who employ traditional rudimentary technology and whose primary production orientation is to satisfy household subsistence needs. A second important farmer group is growers with modest size holdings (up to 30 hectares), who utilize a limited degree of modern inputs and are active market participants. In many instances the combined land area of cooperative base group members is significant, in some cases exceeding 100 hectares.

The project will include five different irrigation systems: micro-systems, small systems, medium systems, large systems and drainage and flood control systems.

Micro-systems will be provided for land areas of less than 5 hectares supplied by small diversion structures and simple manual or gravity fed systems.

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Small systems will be provided to areas between 6 - 30 hectares supplied by either a temporary or permanent surface water source, and having a limited potential for water storage.

Medium systems will be provided to areas between 31 - 100 hectares supplied by a permanent water source and possessing reasonably good water storage potential.

Large systems will be provided to land areas of more than 100 hectares that are supplied by permanent water sources and possess excellent water storage potential

Drainage and flood control systems will cover areas in excess of five hectares and which will serve to stabilize water availability, and counteract flooding, erosion and other damage, or eliminate excess superficial water and lower the water table.

The irrigation technology that will be used will vary according to the system, and will range from simple methods (hand-dug canals) for micro-systems to relatively sophisticated procedures (drip irrigation) for networks encompassing 100 or more hectares.

PART II

Description of the Environmental Setting

Specific irrigation sites are undefined at this moment. However, the areas under consideration will be those of gentle slopes and most of them are presently being agriculturally exploited.

Soil erosion on these areas is not as rampant as those soils on steep areas. Therefore, siltation caused to streams is minimum or nil and water holding capacity may not be as deteriorating as on steeper slopes.

Honduras does not have a regulation for the protection of wildlife. Attempts are made to protect several species with certain laws. The end

result of this situation is that several plant and animals are endangered. Some information collected shows that 35 animal species are endangered and 4 are extinct. No information, if any, was obtained on endangered vegetal species. A partial list of endangered species is as follows: Andora Grandis (casco de burro), Crotalus Durissus (víbora cascabel), Dermochelys Corvacea (Tortuga Baula), Caretta Caretta (Caguama), Caiman Crocodilus (caimán), Harpyhaliaetus Solitarius (Aguila), Ara Ambigua (Guara Verde), Ateles Geoffroy (Mono Araña), Felis Corcoles (Puma), etc.

Archeological resources are widely spread. Olmec, Maya and Chibchan structures, tools and utensils can be found. Funds and personnel are scarce to prevent any action to preserve and study all sites.

Water resources are limited in several basins, specially during dry weather. Therefore, new water uses cannot be introduced. Some other areas still have plenty of water resources.

Quality of water in creeks and rivers is adequate for irrigation, but it is unsuitable for direct consumption. Raw sewage is discharged into streams. Sometimes not enough time for natural self purification is allowed. About 24.2% of the rural population has piped water, 51.3% has wells and 24.5% has no service, relying heavily on streams and rivers. Around, 44% of the population has a safe excreta disposal method, latrine or toilet. No treatment is given before disposal.

Groundwater potential has not been fully studied. Certain areas are heavily exploited, mainly for irrigation purposes. Groundwater quality information was not available in those offices visited. People at Olancho and other places said water is salty in the shallow aquifer, but good at deeper places.

The diarrhea situation in Honduras is of concern. It is estimated that 2,000,000 cases of diarrhea per year occur in the age group 5 years or less. Each child incurs 2 to 5 episodes per year with an average of

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3. The morbidity rate during 1983 was 219.4 per thousand children. Diarrhea is the top killer in children one year old or younger.

In rural Honduras, 15.4% of all water-related and non-water related diseases are malaria cases. This disease has a very high economic impact on rural areas because an infected campesino needs about three months to fully recover from malaria.

Eutrophication problems (premature aging) have appeared in several water courses. This is believed to be caused by agricultural practices and raw sewage discharges. Rio Guacerique is an example of these phenomena; eutrophication has appeared at Los Laureles Reservoir just where the river reaches it.

Honduras is one of the poorest countries in Latin America. In 1984 the annual per capita income was $776. The Gross Domestic Product (GDP) has been in decline to reach a negative rate of about 1 per cent. Peasant farmers or farm laborers are the hardest hit due to this economic downturn. About 80 percent of this group had earnings below the calculated poverty line income of $230 per capita per year. Malnutrition affects 70% of the population.

Part III

Identification and Evaluation of Environmental Impacts

The Project has been designed to provide irrigation systems economically and environmentally sound, to develop the institutional capacity within the DRH to plan and execute irrigation interventions and to environmentally train people involved in irrigation.

By doing so, several beneficial impacts will be attained. Land productivity is expected to increase 30 - 40% and hence the economic condition of campesinos. This will lead to increased labor demand and, in some cases, population inflows with accompanying increases on utility

services and demand of goods. A secondary impact will also be the increment on commercial trading.

Basic natural resource data will be increased by collecting data on water quality, soil properties, plants and animals during the environmental assessment.

Malaria incidence may be reduced by reducing mosquito breeding sites with appropriate design of irrigation systems. Diarrhea may also be reduced, if the supply of safe water for domestic purposes and waste disposal practices are an integral part of irrigation projects.

By ecologically training the campesinos about the environment and his impact upon it, awareness will be increased. Endangered species used as food will not be disturbed if an alternate source of food is available to campesinos; spare time for hunting will already be reduced by the introduction of more intense irrigaton practices.

Some unavoidable adverse impacts would exist. They can be minimized if adequate operation and maintenance of irrigation systems is observed.

Sources of water will be under higher stress, specially on those areas where water resources are scarce. This impact is minimized by reducing water losses in canals and selecting appropriate crops.

Pesticide concentration in water courses will increase due to increase on land use. Salt concentrations will increase both in surface water and groundwater. Nitrogen and phosphates concentration in water courses will also increase, therefore, a higher potential for eutrophication may exist.

Some erosion of productive soils and siltage of water courses will result from construction activities, also some dust will be produced during construction and operational activities.

Part IV

Recommendations for Environmental Action

Having evaluated the Irrigation Development Project for potentially significant environmental impacts, it is concluded that the overall impact of this project will be beneficial and that the majority of any potential negative impacts will be minimized by careful design, construction and maintenance of irrigation facilities, and raising the awareness level of the participants in the project.

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April 3, 1986

TO: William G. Kaschak ADMD

THROUGH: Richard L. Owens O/RD

FROM: Morris C. Anderson
Experience, Inc. Review Team

SUBJECT: Contract Management/Commodity Review

Attached is the subject review of recommended procedures to be used by United States Agency for International Development (USAID) and the Directorate of Hydraulic Resources (DRH), in procurement of international and local commodities, and management of design and construction contracts.

Contents of Attached Review

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RECOMMENDED CONTRACT MANAGEMENT AND COMMODITY PROCUREMENT

Prepared by M. Anderson
Experience Inc.

Contract No. AID/PDC 1096-1-00-4161-00

Introduction

The project will consist of two integrally related components, actual construction and rehabilitation and maintenance of irrigation systems, and the strengthening of Honduran institutional capability to plan and execute irrigation investments on a country-wide basis. The project has a life span of seven years. The estimated cost is 30.0 million U.S. dollars, a combination of AID Grant/Loan and GOH counterpart funding.

The project will be implemented by the Directorate of Water Resources (DRH) of the Ministry of Natural Resources. To carry out the responsibilities of the project, DRH will create a special irrigation management unit (IMU), which has the responsibilities to assist with a new major Water Law, assist in the development of a national irrigation plan and to coordinate and manage irrigation design, construction operation and maintenance activities by the use of private Honduran firms under contracts to the Directorate (DRH). The project will finance procurement of technical assistance, commodities, training for host country personnel, funding for irrigation design, construction operation and maintenance work, operating expenses, salaries, per diem, etc.

PART I

PROCUREMENT - SERVICES AND COMMODITIES

The Project envisages essentially seven procurement actions:(1) the purchase of commodities; (2) both off-shore and off-shelf (local) procurement ; (3) furnishing of main and regional offices with technical and engineering equipment; (4) the purchase of vehicles; (5) provision of technical assistance; (6) training; and (7) design, construction and maintenance contracting. (See Annex 1 for AID contracting and procurement action schedule) and (Annex 1-A for Procurement Summary).

GOH/DRH "Contracting Agency"

Design, Construction Contracting and Local Procurement

For the purpose of this Project, GOH (the Borrower/Grantee) will delegate contracting authority to DRH with the responsibility of awarding contracts for local procurement and design, construction, rehabilitation and maintenance contracts, not to exceed the equivalent in local currency of $200,000. Local purchases will be effected by the DRH using GOH Special Procurement Services. DRH as the "Contracting Agency" will use the services of a technical consultant furnished by the project as an advisor in performing its procurement and contracting responsibilities. As solicitations for contracts for these responsibilities and services will be competed for locally, the basic A.I.D. regulations and guidance that must be followed for this project are listed in Annex 2.

The AID Mission is responsible for providing assistance to the "Contracting Agency", to the extent necessary, in the application of the rules and guidance of these Handbooks. This can also be done by the contract technical consultant working with contracting and procurement officers of DRH.

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It is not expected that any construction materials will be required from the U.S. Most construction will be uncomplicated, of an appropriate technology nature, and will not require any sophisticated equipment beyond what PROMECA and qualified local contractors already posess or have the capability to obtain. DRH/IMU will not require any construction equipment beyond such items as field levels, surveying equipment, water measuring devices and etc. Other materials, e.g., cement, bricks, plastic and metal piping, small pumps, steel reinforcing rods, metal outlet doors for canals and hand tools, can all be purchased locally. A list of start up items to be purchased locally is attached as Annex 3B - (See Annex 2 for off-shelf procurement regulations).

DHR has let numerous contracts under FAO-financed projects and is somewhat familiar with AID's contractual procedures. With the advice of the technical consultant, this phase of the project will not present undue administrative problems.

AID Procurement Services - Plan and Method

Grant and Loan funds will be made available by AID for contracting technical assistance, off-shore commodities, vehicles and training and will be contracted directly by AID using institutional, PSA, PSC and PASA modes.

For technical assistance, an institutional contract will be let to the most responsive, qualified bidder to an RFP that will be issued by the Mission. The technical assistance will include, but not be limited to: a counterpart to the DRH delegated director for this project (chief of party), and long and short term consultants in: agronomy, agriculture, agriculture engineering, extension, and water policy. Other short term specialists can be brought in under the technical assistance contract as deemed necessary by DHR, AID and the Chief of Party.

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The Technical Assistance contract should also include certain commodities, e.g. vehicles and other equipment that the consultants will need. It is recommended that the contractor start the project with four diesel powered 4-wheel drive a/c equipped station wagons similar to the AMC "Cherokee". Please see Annex 3 (Commodities).

International Commodity Procurement

PIO/C's with specifications for off-shore procurement are attached as Annex 3-A. The commodities listed in the PIO/C's are for items needed to implement the Project and are not available locally. These commodities will be used throughout the Project. Other commodities will be needed as the Project expands and progresses. In anticipation of these needs, the DHR and the T.A. consultant team should reevaluate the Project commodity needs periodically. These re-evaluations and requests for commodities would be divided into what can be purchased locally through the Honduran procurement system in accordance with AID Procedures concerning advertising and competition. Those items that cannot be purchased locally will be purchased directly by AID using PSA or the T.A. contractor if it has the necessary expertise.

After an intensive study observing local conditions and personnel, and in cooperation with GOH and AID officials and the other Experience, Incorporated team members, the above method of procurement of technical services and commodities is judged as the most feasible, flexible and expedient for this project.

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PART II

RECOMMENDED MANAGEMENT PROCEDURES BY "CONTRACTING AGENT"

While DRH will be the principal counterpart institution for this Project, management and project planning will have to be strengthened in order to carry out the management of irrigation systems designing, constructing and contracting. Observations indicate that, at present, DRH will need substantial technical guidance to carry out the objectives and goals envisioned in the PID.

Contract Management

DRH acting as the "Contracting Agent" for GOH (rather than A.I.D.) contracts the design, construction, rehabilitation and maintenance activities required to implement and carry out programs proposed by the Project and financed under this loan. In so doing, DRH will be provided the services of one of the technical consultants to insure that contracts and the contracting is in compliance with AID regulations stated in Annex 2 and those stated in the Loan Agreement.

The "Contracting Agent" will appoint a qualified consultant as the contracting officer for this project, preferably the architect/engineer to advise and to perform certain responsibilities of the "Contracting Agency". To this extent, the employee (engineer) so assigned and the "Contracting Agency" are interchangeable. The responsibilities of the contracting officer are to provide the necessary assistance to the "Contracting Agency" in awarding and administering contracts. This may include final design work, developing contract specifications, preparing invitations for bids, evaluating bids, overseeing the work under the contract, etc.

Formal AID approval of the executed contract is required whenever the total contract amount exceeds $200,000 or equivalent in local currency. Any amendments to contracts approved must also be approved by AID. Further, any invitations for bids (IFB) for contracts

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estimated to exceed $200,000 or equivalent in local currency must have AID's approval before issuance. Approval of contracts of a lower value and/or decisions by the "Contracting Agency" during the contracting process may also require prior AID approval. AID approval requirements will be set forth in a Project Implementation Letter.

Contracts for construction services will be awarded on the basis of formal competitive bids. This includes public advertising for prequalification, issuance of IFB's, public opening of bids, and the evaluation of bids. The contract will be awarded to the lowest responsive and responsible bidder.

In regards to local contractors, DRH will evaluate all known contractors on a periodic basis, usually once a year. When a new firm is established, it may submit qualifying documents to DRH at any time and DRH will enter the contractor on the list of contractors. The pre-qualifying procedures that DRH presently use are the same as those used by FAO, IBRD and meet the A.I.D. regualtions stated in AID Handbook II Chapter 2 (Procurement of Construction Services.)

The method of payment to the contractor is to be described in the IFB and on the competitive contract forms as agreed upon by DRH and the AID Mission in the Project Agreement.

The responsibility of the "Contracting Agency" and AID for the contract does not cease when the contract is awarded. The "Contracting Agency" has the primary responsibility for ensuring that the Contractor performs in accordance with the terms of the project.

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AID will have certain approval responsibilities for contract administrative actions, e.g. change orders, contract amendments etc. Both the "Contracting Agency" and AID have to make certain certifications in order for the contractor to be paid.

The "Contracting Agency" must be aware of the contractors performance at all times. Any problems or delays will be analyzed and appropriate action taken as soon as possible.

No international bidding is envisioned for construction work for this project; rather, all the contracts will be competed for locally. Therefore, the required AID regulations that the "Contracting Agency" must abide by are stated in Annex 2. The Spanish version of AID Handbook II, Chapters 2 and 3 are to be furnished to the "Contracting Agency".

In consideration of Borrower/Grantee required compliance with AID regulations concerning this grant/loan, there are also GOH regulations which the DRH must include in contracts for obtaining contractual services. In compliance with these GOH and AID regulations the following method of how work/projects will originate, be designed, and contracted, was developed during this review and are listed below:

Contract Preparation and Management

1. Upon the formation of an IMU, a list of all pending requests for irrigation assistance, whether unfinished projects or proposed projects, and the project goals will be put in prioritized order. DRH will select a priority site.

2. This will be followed by a two-part feasibility study. The first part would be establishing the scope of work, costs of earth moving, drainage, needed improvement, dikes, dams,

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cleaning of right of way . etc. These costs will define the magnitude of the project.

The second phase includes the designing of the project and determining the total cost, the expected economic benefits, potential for additional production, population served, estimated time to complete, maintenance factors and supervision. At this point, DRH decides if the project design is to be done in-house or contracted. If the design work is contracted, the scope of work will be stated and let out for bid under procedures that follow.

3. In preparation of the bid document DRH will have to make or have done engineering studies, topographical surveys and specifications of the design and scope of work to be done. When all the basic studies are done and the project is completely designed and the project is ready to let out for tendering, DRH/IMU submits the package to A.I.D. for approval. Usually the site will have been visited by A.I.D. monitors and only a review and approval procedures are needed.

4. On receipt of A.I.D.'s approval, DRH advertises the bids and also advises the prequalified list of local contractors. The bid period will be established as the scale of work is to be done is known. However, the period normally will be 15 working days.

5. The types of bids called for can be for design work only, construction and design, rehabilitation or maintenance. The bids may be also let for time and unit pricing, stated price bids and piece work.

6. DRH, upon receipt of bid offers, forms a committee of A.I.D. TA's, DRH, MNR, to analyze the bids. Upon selecting the

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bidder, he/she must sign the bid documents.

7. When the contractor is selected, DRH/AID prepares the contracts and takes it to the Administration Probity office and the National Budget Directorate who will issue a resolution. The resolution specifies that the contracts are in accordance with financial and legal requirements. In addition, it specifies the modifications the contract may need in order to comply with the laws and regulations of the Government of Honduras and A.I.D.

8. When DRH receives the resolutions issued by the National Budget Directorate, changes are made if necessary and AID advised.

9. Concurrently to contract preparation, DRH will prepare a contract or agreement for approval by the President of the Republic.

10. The prepared contract and agreement are then submitted to the Minister of Natural Resources who, in turn, will submit these to the Attorney General. It is he and the contractor who are the final signatores of the contract.

11. The President of the Republic receives the Agreements and contracts and approves them by means of his signature and seal.

12. The contractor, upon receipt of the respective accords, takes necessary steps to obtain a performance bond. This is done by presenting the request to the Contraloría who establishes the amount the contractor has to provide for the performance bond.

13. DRH, upon receipt of the resolution from the Attorney General, will, with AID's approval, issue a start work order, which serves as the basis to determine the contract period.

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14. The contractor then begins to execute the work in accordance with the plans and specifications in the contract.

15. Monitoring of the contract and work will be done by the nearest DRH/IMU regional field office engineers, and by an engineer assigned to the project by DRH/IMU.

16. The Director of DRH, with the Project director and A.I.D. will make the final inspection and will approve or disapprove completion in accordance with the contract.

17. Once the legal notification of work completion has been signed by DRH/IMU with AID's approval, the contractor publishes it in the newspapers so that any creditors can collect payments due. After the legally stipulated payment period is over, the contractor may obtain from the Controller General the final payment. This document will allow the Contractor to recover his performance bond.

The Rural Development Division of the Mission will participate in the overall supervision and implementation of the contracts. This can be done by a contractor technical consultant acting for the Rural Development Officer in charge.

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PROPOSED TIME TABLE

*Dates	
Oct. 1986	Project Paper and Loan Agreement signed
Oct. 1986	IQC issued and assistant project and liaison officers named by USAID
Oct. 1986	DRH names staff. DRH is to be expanded and new staff members named to comply with Project Agreement.
Oct. 1986	DRH develop a plan of action to include irrigation, rehabilitation, maintenance projects in priority order and prepares first year operation budget, defined to a Quarterly basis
Oct. 1986	USAID/H sends RFP to AID/W and PIO/C for commodities to AID/W/SER/CM
Dec. 1986	T.A. contract awarded
Feb. 1987	T.A. consultants arrive. Minimum of Chief of Party and a consultant who is to act as counterpart to "Contracting Agency" in contracting and local procurement (preferably agricultural Engineer).
Feb. 1987	DRH and T.A. consultants make presentation of budget requirements and project plans to AID, MNR and BANADESA.
Feb. 1987	Budget and planning approvals sent to DRH
March 1987	T.A. Additional consultants arrive.
March 1987	DRH lets first design, construction rehabilitation bids for the project.
March 1987	AID commodities start arriving. Receiving reports, titling and licensing supervised by counterpart TA.
May 1987	DRH/TA re-evaluates commodities and reorder as necessary
June 1987	T.A. All consultants are on board.
June 19887	All first tranche of commodities on board and in place.
Oct. 1987	AID/DRH/TA. Review of the total project accomplishments, staffing, and revisions made in budgeting and planning.
Oct. 1987	AID evaluates the T.A. consultant staff (increases or decreases)

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PROPOSED TIME TABLE (cont.)

*Dates

Jan. 1988	Second franche of commodities ordered as requested by T.A. consultants and DRH/IMU. AID to order by using AID/W - IQC's.
April 1988	Commodities arrive.
Oct. 1988	Program re-evaluated. Revision made if needed in budgetary and planning areas.
Oct. 1988	AID/H re-evaluates the T.A. consultancy staff. Making determination to maintain or change.

*These dates are estimated and can be moved up or down. However, the time intervals between dates and actions are considered realistic.

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Summary - Commodity Procurement

There are three potential methods of procurement for this project:

1. T.A. Contractor procurement
2. AID - Direct procurement by an IQC PSA
3. Off-shelf (Local procurement by DRH)

It is recommended that the T.A. contract include funds for procurement of four vehicles for the team's use and, further, that the T.A. contractor be authorized to do all off-shore procurment if it has this expertise. The advantage of this method is that if commodities do not arrive in a reasonable time frame, the contractor cannot blame project failures on AID or GOH for the lack of the project commodities.

If the T.A. contractor is not qualified to do procurement, using an IQC PSA contractor would be the most efficient and economical method. In this vein it is recommended that the T.A. team evaluate the commodity situation soon after their arrival and compile a requisition for items needed at that time for the project. (See page 2 of Annex 1). This will also apply to the computerization of DRH. A thorough study of the computer needs was done during this review, the results of which are attached to this Annex 1A. It is recommended that this order not be placed until the T.A. team has a chance to study the proforma and include their input on the type of computers they wish to use and train the DRH personnel on.

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datum S. A. DE C. V.

WANG

COTIZACION

CLIENTE: PROYECTO AID/PDC 1096-1-00-4161-00
Att: Anderson Morris
FECHA: 25 de Marzo de 1986.
DIRECCION: Tegucigalpa, D.C.
REFERENCIA: MFM/cmv/v0297a

HARDWARE

CANT.	MODELO	DESCRIPCION
1	VS15-16BN	Unidad central de proceso con 1,024 KB de memoria y unidad de disco fijo de 147 megabytes, y sistema operativo de memoria virtual con utilitarios. Lenguajes de programación.
4	4210VS-I	Estación de trabajo inteligente con pantalla de 80 x 24 posiciones moncromáticas verde en negro y 64 KB de memoria interna (procesamiento de datos y palabras, gráficos).
1	2529V	Unidad de Cinta magnética tipo cartucho de 4 canales 6,400 BPI, con 14 MB de capacidad.
1	5573	Impresora de banda de 250 lpm de 132 posiciones para formas contínuas.
1	5577	Impresora Matricial bidireccional de alta densidad para la impresión de carta ó gráficos, con calidad de caracteres a 40 caracteres por segundo o listados de borrador de 192 caracteres por segundo.

TOTAL F.O.B.	U$	75,285.00
TOTAL INSTALADO CON DISPENSA OFICIAL	Lps.	158,099.00
MANTENIMIENTO MENSUAL	Lps.	960.00

datum
S. A. DE C. V.

WANG

C O T I Z A C I O N

CLIENTE: PROYECTO AID/PDC 1096-1-00-4161-00
Att: Anderson Morris
FECHA: 25 de Marzo de 1986.
DIRECCION: Tegucigalpa, D.C.
REFERENCIA: MFM/cmv/v0297a

SOFTWARE

CANT.	MODELO	DESCRIPCION	
1		Sistema operativo para el Wang VS versión 6.40.00.	SIN COSTO
1	196-009A-X	Procesamiento de palabras de Wang.	SIN COSTO
1	195-102A-X	Compilador de FORTRAN	SIN COSTO
1	195-103A-X	Compilador de BASIC	SIN COSTO
1	195-104A-X	Compilador de COBOL	SIN COSTO
1	195-105A-X	Compilador de RPG II	SIN COSTO

datum
S. A. DE C. V.

WANG

COTIZACION

CLIENTE: PROYECTO AID/PDC 1096-1-00-4161-00
Att: Anderson Morris
FECHA: 25 de Marzo de 1986.
DIRECCION: Tegucigalpa, D.C.
REFERENCIA: MFM/cmv/v0297a

SOFTWARE OPCIONAL

CANT.	MODELO	DESCRIPCION		
1	20/20-VS	Hoja electronica para modelaje de sistemas financieros.	US$	3,750.00
1	VS-GF-X	Gráficos Financieros para la VS.	US$	3,750.00

Summary - Commodity Procurement

Local Procurement

AID to establish a revolving fund in GOH currency to finance local costs of contracts and off-shelf procurement. For local commodity procurement DRH would periodically submit reimbursement vouchers with appropriate expenditure documentation to AID. After Mission review and approval of the submission, the revolving fund would be replenished from the project dollar resources. For the recommended method of procuring off-shelf items, see Annex 2 page 2.

In-House Design and Construction

For design and construction work that is done by DRH, it is recommended that a Force Account be established to reimburse DRH for its expenses for work done on in-house design, construction, rehabilitation and maintenance of irrigation systems accomplished under this project.

AID REGULATIONS FOR LOCAL PROCUREMENT AND CONTRACTING

Contract Approval. Formal AID approval of an executed contract by the "Contracting Agency" is required whenever AID financing is involved and the total contract amount exceeds $100,000 or equivalent in local currency. Contracts exceeding this amount must be done through formal competitive bid procedures, using public advertisement, issuance of invitation for bids (IFB), etc. AID approval for bids under $100,000 may not be required. However, bids still must be awarded on a competitive basis among local qualified contractors. DRH is to provide a list of prequalified bidders which is to be attached to this review as an annex.

Nationality and Source. The authorized geographic code for this Grant/Loan is 941 (Selected Free World).

Mandatory Clauses that the contracting agency is required to use in all construction contracts are stated in clause 73 of conditions of contract. This clause must be attached verbatim to each contract. In effect, this clause recognizes AID's role as the financing entity and protects AID against exposure to liability.

Competitive principles refer to competitive contracting methods per AID Handbook 11, Chapters 1, 2 and 3. Contracts for construction in this project will be made by the contracting agency (DRH) on the basis of formal competitive bidding among qualified local contractors. (See "contracting agency" DRH) procedures for management of design and construction contracts with private sector firms).

Construction contracts and off-shelf procurement will be fairly low value, and will be let on competitive bid basis. DRH has let numerous FAO financed construction contracts before, and is somewhat familiar with AID's contract procedures. With the advice of a technical consultant, this project will present no undue administrative problems.

Procurement of Off-shelf Commodities and Local Services

Local cost financing refers to the use of appropriated dollars to finance procurement of goods and services paid for with local currency in the Host Country for the purpose of carrying out AID financed projects in that country. DRH acting as the Contracting Agency will be guided by AID Handbook No. 1, Supplement B, pages 18-1 through 18-5 in the procurement of off-shelf commodities and local services. A copy in the Spanish Language is to be provided to the "Contracting Agency".

To better implement the project and not to "ham-string" the operation later for the lack of a lead pencil or paper, the following is recommended for off-shelf procurement:

1. Purchases of under the equivalent in local currency of $1,000 are allowed on the signature of the DRH project director approved by AID.

2. Purchases over $1,000 up to the equivalent in local currency of $5,000 be authorized upon quotation from at least three local suppliers.

3. Any purchase over the equivalent in local currency of $5,000 must be by the (IFB) process.

PIO/C'S

Items	Estimated CIF Costs
Vehicles (incl. 20% mark-up for spare parts)	$56,000
Motorcycles (does not include spare parts)	$15,000
Air conditioners	$2,500
Office Furniture	$3,500
Drafting Surveying Equipment	$50,000
Copier - Calculators - Typewriters	$5,000
Local Procurement	$15,000

PIO/C

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT IMPLEMENTATION ORDER/COMMODITIES

☐ Worksheet ☐ Issuance

PAGE 1 OF ___ PAGES

1. Cooperating Country

2. PIO/C Number

3. Project Number and Title

4. Appropriation Symbol

5. Allotment Symbol and Change

6. Funds Allotted To ☐ AID/W ☒ Mission

7. Obligation Status ☐ Administrative Reservation ☐ By Agreement

8. ☐ Original OR Amendment Number _____

9. Authorized Agent

10. Method of Financing A. ☐ U.S. Government B. ☐ Direct Letter of Commitment

11. Contracting Period (Mo., Day, Yr.) From: To:

12. Delivery Period (Mo., Day, Yr.) From: To:

13. Project Assistance Completion Date (Mo., Day, Yr.)

14. Area of Source

15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

PROJECT COMMODITIES

4 each Utility Pick-Ups - metal cab, cab to have solid front bench seat with passenger jump seat behind front seat for passengers, crew cab or deluxe cab style. 4 wheel drive, dual range transfer case 4-5 speed manual transmission, 4 cylinder diesel engine of at least 2,000 cc. displacement, heavy duty off the road mud tires, spare tire same size as others, all with tubes. 16 gal. fuel tank locking cap, wheel wrenches and jack. Front and rear bumpers, spare wheel lock, AID emblems, maintenance manuals, dual outside mirrors, beige or white color, a/c equiped.
Price quotation to include 20% mark-up for spare parts. Spare parts printout to be sent to AID Mission (Honduras) by successful bidder. Mission will select 20% of vehicle acquisition costs from spare parts listing and advise manufacturer to ship spares. Vehicles to be shipped prior to spare parts.

17. MISSION REFERENCES

18. MISSION CLEARANCES	DATE	MISSION CLEARANCES	DATE

19. Date of Original Issuance

20. Date of this Issuance

21. For the Cooperating Country - The terms and conditions set forth herein are hereby agreed to:

Signature _____ Date _____

Title _____

22. For the Agency for International Development

Signature _____

Title _____

Date _____

AID 1370-1 (10-79)

(b)

PIO/C

AGENCY FOR INTERNATIONAL DEVELOPMENT

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6. Funds Allotted To: ☐ AID/W ☒ Mission

7. Obligation Status: ☐ Administrative Reservation ☐ By Agreement

8. ☒ Original OR Amendment Number _____

9. Authorized Agent: USAID/Honduras

10. Method of Financing: A. ☒ U.S. Government B. ☐ Direct Letter of Commitment

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15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

Quantity	Description	Estimated Costs
6	250cc, 4 stroke, gasoline fueled, off/on road motorcycles, with seating for two persons, manual transmission, tire sizes" front 2.75 x 21 rear" 3.50 x 18 both 4 ply with fenders and repair manual in Spanish	9,000
	Shipping and contingencies (25%)	2,250
		11,250

17. MISSION REFERENCES

BASIS OF DELIVERY: CIF TEGUCIGALPA, Honduras

SOURCE-ORIGIN Waiver attached.

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AGENCY FOR INTERNATIONAL DEVELOPMENT

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8. ☐ Original OR Amendment Number _____

9. Authorized Agent: USAID/Honduras

10. Method of Financing A. ☐ U.S. Government B. ☐ Direct Letter of Commitment

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13. Project Assistance Completion Date (Mo., Day, Yr.)

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15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

4 each Air Conditioners: Window/wall mounted to fit openings 28X40 inches, 3 speed of on, adjustable air deflectors, vent control exhaust air or circulates room air. Cabinet constructed of double coated galvanized steel - High impact styrene grill, 12,000 to 18,000 BTU, 208 volt, 60 cycle, to be furnished with installation kit and permanent polyurethane filter

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15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

2 each Office Desks - Double pedestal, steel construction, durable, walnut grained, laminated platic top, center drawer with lock, measurement 60 x 30, gray color

3 each Office Desks - Single pedestal, steel constructed, durable walnut grained, laminated, plastic top, one box drawer and one suspensio file drawer, 40 x 24, color gray

4 each Swivel chairs - Foam pad seat, back and arms, set 20" wide, 19" deep, 4" thick back, 16 1/2 x 13 1/2, die formed base with scuff guards, 2" ball bearing casters, color gray.

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15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

1 each Storage Cabinet - metal, double doors, 22 gauge construction, 72 high x 36" wide, 18" deep, supplied with 5 each 22 gauge metal shelves, shipped knocked down, color gray, lockable

3 each File Cabinets - steel construction, welded frame, interchangeabl file drawers, hand hold on back of drawer for carrying, each drawer to rest in full cradle suspension, 5 drawer, topo drawer locking system, legal size, 18W x 26 1/2 deep, 28 height drawers color gray.

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13. Project Assistance Completion Date (Mo., Day, Yr.)

14. Area of Source

15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

1 each Copier: Desk top type, 115 volt, 60 cycle, automatic paper feeding - feed to accomodate 8 1/2" x 11, 10 x 14", to legal 3 1/2 x 2 in. business cards. Capable of performing 1 to 1 reproduction on copy sheet plus enlarges to 120% and reduces by 67 to 78%. Automatic paper feeding with single sheet by-pass for two sided copying. To be able to accept sheets and books, 3-dimensional originals, to be able to copy on plain paper. Supplied with paper cassettes and dust cover. Successful supplier to advise contractor for ordering paper.

17. MISSION REFERENCES

2 each Selectric II Typewriters, 110 volts, 60 cycle, Spanish key board

36 each Film ribbon, correctible

36 each Lift-off Tape

5 each Extra Type Element - Pica

5 each Extra type Element - Letter Gothic

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AGENCY FOR INTERNATIONAL DEVELOPMENT

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13. Project Assistance Completion Date (Mo., Day, Yr.)

14. Area of Source

15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

PROJECT COMMODITIES

1. Surveying equipment

2. Drafting equipment

See continuation sheets for quantity and specifications

17. MISSION REFERENCES

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AID 1370-1 (10-79)

CONTINUATION SHEET	UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY AGENCY FOR INTERNATIONAL DEVELOPMENT ☐ PIO/C ☐ PIO/P ☐ PIO/T ☐ PA/PR	☐ Worksheet ☐ Issuance	PAGE ___ OF ___ PAGES
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		2a. PIO Number	2b. ☐ Original OR Amendment No. ___
		3. Project Number and Title	

Indicate block numbers

Use this form to complete the information required in any block of a PIO/P, PIO/T or PA/PR. For PIO/C, furnish the item number, quantity, description/specifications, including catalog stock number and price when available.

2 Each — Drafting Machine: To fit 35-60 inch table-drawing board. Automatic flow control system. Full 360°, indexing with automatic accurate 15° stops. Baseline release located near protractor head. Interchangeable scales. Finger tip brake control for locking and releasing vertical position of protractor head. Tension cable securely held by special catch. With nylon roller to adjust quickly and easily to variations in board surfaces. Machine to be delivered with all necessary equipment and easy to follow Spanish instructions - to be used by right handed draftsmen.

Qty Stated — Scales for Drafting Machines: Scales to be luxylite transparent palstic with high degree of dimensional stability. Graduations on the underside of scale to avoid parallar errors. Scales must be compatible with above drafting machines, also to be in metric as well as English:

- 4 each 9" long, 1st edge 1/8 and 1/4 to 1 ft.; 2nd edge 1/2 and 1in. to 1 ft.
- 4 each 12" long. 1st edge 1/8 to 1/4 to 1 ft. 2nd edge 1/2 and 1in. to 1ft.
- 4 each 12" long. 1st edge 3/8 and 3/4 in to 1ft. 2nd edge 1 1/2 and 3 in. to 1 ft.
- 2 each 12" long. 1st edge 1/8 in. to 1 ft. 2nd edge 1/4 to 1ft.
- 2 each 18" long. 1st edge 1/8 and 1/4 to 1 ft. 2nd edge 1/2 and 1 in to 1 ft.
- 2 each 18" long. 1st edge 1/8 in. to 1 ft. 2nd edge 1/4 in to 1ft.
- 2 each 18" long. 1st edge 3/8 in to 1ft. 2nd edge 3/4 in to 1 ft.
- 2 each 18" long. 1st edge 1/2 in to 1 ft. 2nd edge 1 in. to 1 ft.
- 2 each 18" long. 1st edge 1 1/2 in to 1 ft. 2nd edge 3 in to 1 ft.
- 2 each 18" long. 1st edge 10 parts to one in. 2nd edge 50 parts to 1 inch
- 2 each 18" long. 1st edge - full size to 1/50 in. 2nd. edge full size to 1/32 inc.
- 2 each 18" long. 1st edge millimeters. 2nd edge half size to 1/mm

2 sets ea. — Lettering sets: combination capital and lower case. Set to come in polished wooden case, with 11 templates and 11 pens. 120CL adjustable scriber, scriber stand, lead clutch, socket holder, pen holder and ink cartridge.

CONTINUATION SHEET	UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY AGENCY FOR INTERNATIONAL DEVELOPMENT ☐ PIO/C ☐ PIO/P ☐ PIO/T ☐ PA/PR	☐ Worksheet ☐ Issuance	PAGE ___ OF ___ PAGES
		1. Cooperating Country	
		2a. PIO Number	2b. ☐ Original OR Amendment No. ___
		3. Project Number and Title	

Indicate block numbers

Use this form to complete the information required in any block of a PIO/P, PIO/T or PA/PR. For PIO/C, furnish the item number, quantity, description/specifications, including catalog stock number and price when available.

2 sets ea. Lettering Sets: combination capital and lower case. Set to come in polished wooden case. With 6 templates, 6 pens, 200 CL, adjustable scriber, scriber stand, each clutch, socket holder, penholder and ink cartridge.

4 sets ea. Rapidograph Drawing Point Sets: complete set/unit with point, body, clamping and replaceable in cartridge. Designed for frequent changes in making line width, 7-color coded sizes 00-0-1-2-2 1/2-3-4. Point sections to be easily filled and fit holder

2 each Planimeters: To be direct reading English and Metric. Able to read areas in square inches to 0.01 sq. inc. and square centimeters to a 0.04 sq. cm. complete with adjustable tracer arm and pole arms. Magnifier tracer lens. Zero setting wheel, test rule, needle and ball pole. Range of tracer arm length 2 1/2 to 7 in. Range of pole arm length 6 to 13 inches shipped in lined case and padded top.

3 each Map Measures: Nickel plated. 5 inch, swiveling metal handle with lock nut, dial 1 1/8 in. diameter. Graduated in both English and metric. Revels up to 39 in. in 1/2 in. intervals or up to 99 cm. Must be capable of reading broken and irregular lines.

2 each Plan Measures: Nickel plated. To have 1/8 in scale measurement. Read directly in feet to total of 10,000 ft. on meters equivalent. Long dial graduated in feet and meters.

2 each Drafting tables: top size 36 x 60". Metal frame, fully adjustable slope from horizontal to vertical, height adjustable from 30 1/2" to 40". Wood top. Adjustable ledge.

1 each Tracing Table: Plate glassworking surface 24" x 36", enamelled reflector attached. Shipped with two each 30' watt 36" T-9 flourescent lamps and ballast starter operate on 110 volt

1 each Cabinet - Plans Drawers Stackable: Regular series for 30" x 48" sheets. 5 Drawer and 3 drawer unit, flat cap, flush base, 5 drawer size 50" x 38" x 2", 3 drawer size 50" x 38" x 3 3/4" - general purpose for filing prints, charts, maps and drawings. Complete with one set of base legs. Metal.

1 each Vertical File: Constructed of heavy gauge furniture steel. Stores up to 2,600 prints. Prints to be fastened in a clamp binder. With 26 binders for sheet size 36" to 64".

CONTINUATION SHEET

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT

☐ PIO/C
☐ PIO/P
☐ PIO/T
☐ PA/PR

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1. Cooperating Country

2a. PIO Number

2b. ☐ Original OR Amendment No. _____

3. Project Number and Title

Indicate block numbers

Use this form to complete the information required in any block of a PIO/P, PIO/T or PA/PR. For PIO/C, furnish the item number, quantity, description/specifications, including catalog stock number and price when available.

3 each — Chairs: back rest to automatically adjust. Adjustable height, welded tubular foot rest - seat height adjustable at 5/8" from 24' to 32". Equipped with gliders not casters. Gray finish.

3 each — Floating Arm Lamps: For drafting tables, movable and staying without manual tightening or locking, bases that can be clamped to any surface for opration on 110 volt, with two T-8-15 watt tubes. To be shipped with 18 each extra T8-15 watts light tubes. Finished in bronze baked enamel.

5 each — Leveling Rods - Metagrad philadelphia metric, with replaceable metal scales, automatically compensates for climatic variations. 2.0 meters extneding to 3.7 meters, length closed 2.0 meters, graduation read to 1cm. With micrometer target.

5 each — Stadia Rods: Strong steel hinges with rigid swivel hook locking arrangement, face recessed to protect facings 3 in. wide, metric pennant pattern, length 4 meters folding to two meters. Shipped with covers.

Qty. stated — Measuring Tapes: Metric - engineers steel babbit. Rule 5/16 wide 0.16" thick. Tin coated. Markings and numbers deeply stamped into babbit metal bosses metric markings every meter with first and last decimeter graduated in cm.

6 each - 30 meters
6 each - 50 meters
4 each - 100 meters

6 each — Steel Tape Repair Kits for 5/16" tape. Kit to include: punch and eye letting tools, assortment of ungraduated steel tape pieces - with leatherette case.

Qty. stated — Fiberglass Measuring Tapes: metric and English graduations. Stake point design, black and red markings on white face, closed reel type:

6 each - 30 meters
6 each - 60 meters

AID 1500-1 (6-80)

CONTINUATION SHEET	UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY AGENCY FOR INTERNATIONAL DEVELOPMENT ☐ PIO/C ☐ PIO/P ☐ PIO/T ☐ PA/PR	☐ Worksheet ☐ Issuance	PAGE ___ OF ___ PAGES
		1. Cooperating Country	
		2a. PIO Number	2b. ☐ Original OR Amendment No. ___
		3. Project Number and Title	

Indicate block numbers

Use this form to complete the information required in any block of a PIO/P, PIO/T or PA/PR. For PIO/C, furnish the item number, quantity, description/specifications, including catalog stock number and price when available.

1 each — Geodetic Total Station: Instrument to measure distances and angles at only one set up up to 2,000 meters and give direct digital readings. No mounting or demounting required at eac station. With automatic vertical circle indexing and diametric horizontal circle readings. Built in tribrach for improved stability. Instrument to be supplied with BT-5 battery pack, BC-4 battery charger 110 volts, 50/60 cycle, sun shade, less cap, carrying handle, atmospheric correction calculator, accesory case, cleaning brush, silicon cloth, 2 fuses and carrying case

2 each — Reflector Systems: Triple prism system, containing three prisms with triple prism holder and a target pole, triple prism holder for long range horizontal distance measurements with femal threads for accepting prisms. Can be reversed for mounting 30mm constant prism.

2 each — Single Prism Holder: For short range horizontal distance measurements, with female threads for accepting prism, can also be used reversed with 30mm constant prism.

2 each — Aluminum Prism Pole: 54" closed, adjustable to 8 ft. Immediate locking system. 5/8 x 11 thread fitting for mounting prism, built in calibrated level bubble and head. Grip replaceable hardened steel tip colored orange and white every 12 inches.

2 each — Theodolite: Direct microscale readings to one minute. Automatic circling indexing, twin sighting collimators, detachable tribrach, speedy focusing with infinity targets in field of view, carrying handle, focusing type plumment telescope, tripod screw 5/8 x 11, telescope 152mm long, objective lens 42mm, magnification 30X, complete with plastic carrying case, lesn cap, plumb bob set, cleaning brush and silicon cloth.

3 each — Automatic Level: Magnetically dampened compensator, waterproof construction, speedy pointing and sighting collimator, 32 power W/metal horizontal circle, 109.4mm diameter circle divided to 1°, similar to topeon AT-F2, trigraph mounting system, 5/8x11 center screw

2 each — Standard alidade: Beaman Stadia ARC for distance reduction computation, brass blades, trough compass, striding level, telescope rotates to check collimation, complete with case, sunshade, objective cap, adjusting pins, screwdriver and instruction book in Spanish and English

CONTINUATION SHEET	UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY AGENCY FOR INTERNATIONAL DEVELOPMENT ☐ PIO/C ☐ PIO/P ☐ PIO/T ☐ PA/PR	☐ Worksheet ☐ Issuance	PAGE ___ OF ___ PAGES
		1. Cooperating Country	
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		3. Project Number and Title	

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2 each	Plane Table Board: Board size to be 24x31 inches. Tripod head to consist of two cups accurately lapped together and arranged so the plane table can be readily leveled and rotated in aximuth. With canvas carrying case.
2 each	Tilting Head Tripod: With extension legs, 53" open, 36" closed, legs made of hardwood.
4 each	Tripod: White aluminum to use with tribrach 3 screw instruments, 5/8 x 11 threads. Wide frame, extension legs 44 to 67 inches, die-cast aluminum head, nylon bearings, rugged leg shoes with hardened steel point.
4 each	Aluminum Telescoping Range Poles: Metric model, alternatively banded orange and white every half meter, 5/8 x 11 threads, replaceable hardened steel tips, length 4.5 meters.
2 each	Aluminum Telescoping Range Poles: Metric model, alternatively banded orange and white every half meter, 5/8 x 11 threads, replaceable hardened steel tips, length 7.5 meters.
4 each	Hand Level: 2 x magnification, 1" diameter tube 6" long, extends to 1 3/4 inches. Complete with belt loop leather case.
2 each	Tensiometers: Irrometer soil moisture indicators. Irrometer consists of sealed water filled tube equipped with a vacuum gauge and porous tip. 18" length for use with all irrigated row field and tree crops. Complete with instruction books in English and Spanish.
2 each	Tensiometers: Same as above, but 24" in length
4 each	Tensiometers: Portable, 12" long, for spot check readings, supplied with service unit which includes hand vacuum pump. One bottle of irrometer fluid, 25 monthly chart forms complete with instruction manual
2 each	Earth Augers: to be used for ordinary soil sampling, 5/8" N.C. threaded pin coupling, boil of carbon steel 3/16 thick and 1 1/4 inch in wide. Bits forged of special high carbon steel, cutting edges stelite hand surfaces and shrpened size 2 1/2 in.

PIO/C

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT IMPLEMENTATION ORDER/COMMODITIES

☐ Worksheet ☐ Issuance

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1. Cooperating Country

2. PIO/C Number

3. Project Number and Title

4. Appropriation Symbol

5. Allotment Symbol and Charge

6. Funds Allotted To ☐ AID/W ☒ Mission

7. Obligation Status ☐ Administrative Reservation ☐ By Agreement

8. ☐ Original OR Amendment Number _____

9. Authorized Agent

10. Method of Financing A. ☐ U.S. Government B. ☐ Direct Letter of Commitment

11. Contracting Period (Mo., Day, Yr.) From: To:

12. Delivery Period (Mo., Day, Yr.) From: To:

13. Project Assistance Completion Date (Mo., Day, Yr.)

14. Area of Source

15. DOLLAR VALUE

A. Previous Total	B. Increase	C. Decrease	D. Total to Date

16. Quantity, Description, Specifications, Instructions and Special Provisions

2 each Mud Augers: For use in heavy soil, 5/8" N.C. threaded pin, coupling, bail of carbon steel 3/16 thick and 1 1/4 in width. Bits forged of special high carbon steel, cutting edged stelite. hard surfaces and sharpened, 2 1/4 in size, cylinder designed with open sides for easy dumping. Blades 14" long.

4 each Cross Handles and Extensions: Made of seamless molybdenum tubing, 16" long. Two each extensions in 2', 3', 4' and 5 ft.

17. MISSION REFERENCES

18. MISSION CLEARANCES	DATE	MISSION CLEARANCES	DATE

19. Date of Original Issuance

20. Date of this Issuance

21. For the Cooperating Country – The terms and conditions set forth herein are hereby agreed to:

Signature _____ Date _____

Title _____

22. For the Agency for International Development

Signature _____

Title _____

Date _____

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CONTINUATION SHEET	UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY AGENCY FOR INTERNATIONAL DEVELOPMENT ☐ PIO/C ☐ PIO/P ☐ PIO/T ☐ PA/PR	☐ Worksheet ☐ Issuance	PAGE ___ OF ___ PAGES
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2 each — Desk Top Calculators: Combined 12 digit plain paper impact printer with easy to read 12 digit vacuum flourescent display. Prints 2.5 lines per second on 2 1/4 paper per second. Four functions memory, basic math functions, capable of two color printing. Mixed calculations, square root, decimal point selection of 0, 1, 2, 3 +, complete with instruction manual, dust cover and eight foot cord, 115 v, 60 cycle. Supplier to furnish 48 rolls of 2 1/4 paper.

4 each — Calculators: Print/display, hand held, 10 digit flourescent display, printing on standard 2 1/2" paper, capable of all math functions, operates on rechargeable nicod batteries or 115 volt, 60 cycle.

12 each — Solar powered pocket calculators: Performs the four basic math functions, percent and square root, with four key memory function. Display to show eight digits, complete with plastic case and instructions.