

SECOND EVALUATION OF THE
USAID/GOVERNMENT OF EL SALVADOR
WATER MANAGEMENT PROJECT
(Project No. 519-0303)

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PREFACE

This is the second evaluation of the El Salvador Water Management Project. It has been prepared by the Development Assistance Corporation under the terms of IQC Delivery Order No. PDC-4109-I-01-7082-00 with the United States Agency for International Development. The evaluation team was composed of the following individuals:

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Field work in El Salvador was carried out over a four-week period during March 1990. A draft report was presented to USAID/El Salvador prior to the team's departure. The USAID made comments on the original draft which have been incorporated into this final report.

ACRONYMS AND ABBREVIATIONS

ARSP	Private Sector Irrigation Association Asociacion para Riego del Sector Privado
ASPENT	Salvadoran Association of Producers and Exporters Non-Traditional Products Asociacion Salvadorena de Productores Exportadores de Productos No-Tradicionales
BH	Mortgage Bank/Banco Hipotecario
CENCAP	National Training Center/Centro Nacional de Capacitacion Agropecuaria
CENTA	Center for Agricultural Technology Centro de Tecnologia Agricola
DGRD	General Directorate for Irrigation and Drainage Direccion General de Riego y Drenaje
ENA	National School of Agriculture Escuela Nacional de Agricultura
FUSADES	Salvadoran Foundation for Economic and Social Development/Fundacion Salvadorena para el Desarrollo Economico y Social
GEMA	Coordination Office for the Public Sector, Water Management Project Gerencia de Manejo de Agua
GOES	Government of El Salvador/Gobierno de El Salvador
MAG	Ministry of Agriculture/Ministerio de Agricultura
OA	Water Office/Oficina del Agua (OEDA)
OCOPROY	MAG/AID Project Coordinating Office Oficina Coordinadora de Proyectos MAG/AID
OSPA	Agricultural Sector Planning Office Oficina Sectorial de Planificacion Agropecuaria
PP	Project Paper
WS II	Water Synthesis II Program (AID/Washington Project)
USAID	U.S. Agency for International Development Agencia de Los Estados Unidos para el Desarrollo Internacional

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EXECUTIVE SUMMARY

This is the report of the second evaluation of the USAID/El Salvador Water Management Project (no. 519-0303). This project is a five-year with a grant of \$18,744,000 from the United States Government and contribution of \$6,406,500 from the Salvadoran Government, for a total of \$25,150,500. This effort began in 1986 with the goal of generating employment, income and foreign exchange through the promotion of diversified irrigated farming. It focuses on institutional strengthening, technology transfer, training, and credit assistance, and divides its activities into two segments. The first supports public irrigation planning, extension and training institutions, and the second supports private firms engaged in or directly connected to intensive agriculture and export marketing research and development.

The project's first evaluation was conducted in November 1987 and revealed that little progress was being made, especially as concerns public sector activities. Reasons given for this concerned primarily the late arrival of technical assistance personnel and administrative difficulties which were often related to El Salvador's tumultuous political situation.

This second evaluation was performed during March 1990 by a team of two outside specialists. The evaluation methodology consisted of reviewing project documentation, conducting interviews of administrators, technicians, farmers, and processors, and visiting project field sites. In contrast to the first, this second evaluation notes that significant progress has since been made in almost every aspect of the project. This appears to be due in large part to the arrival and productivity of long-term technical assistance personnel, and a noticeably better political climate since the Cristiani government took office.

Progress made by public sector institutions is primarily to the establishment of a coordinating unit which meets weekly to guide project activities. Specifically, this entity has coordinated the realization of several activities, including: the initiation last year of a process for elaborating annual, inter-agency work plans; performing a diagnosis of water use in the agricultural sector; evaluating all water use laws and proposing a new water use policy and law; establishing a data bank to monitor progress and improve future planning; and developing combined training and technical assistance plans for technicians and farmers. Through this increase in planning and coordination, as well as the training provided, there has also been a marked improvement in the technical capacity of the staff at the six public institutions associated with the project (CENTA, CENCAP, DGRD, ENA, OEDA, and OSPA). It is expected that they will surpass the goal set forth in the Project Paper for the number of farmers assisted.

v.

The private sector, through FUSADES/DIVAGRO/FIDEX, has also made strides since the last evaluation. FIDEX makes loans under the Project for irrigation equipment and to processing facilities, and between 1987 and 1989, they increased their loan approvals from 5 to 12 for irrigation equipment, and from 3 to 25 for processing facilities. Their total loan portfolio is now \$8,958,683.

DIVAGRO, the FUSADES research and extension arm, now has partially funded 41 field agents working for processors and farmers. They have a data bank and library that are the best in the country for irrigated agriculture. Both agencies, DIVAGRO and FIDEX, have also greatly benefitted from in-country training and international short courses and study tours.

The progress under the project is demonstrated in the table below. This table compares the quantifiable goals of the project as set forth in the Project Paper with USAID/El Salvador's latest records for actual project output as of September 30, 1989.

PROJECT QUANTIFIABLE INDICATORS AND PROGRESS AS OF 09/30/89:

Indicator	Quantity Planned	Quantity Accomplished to Date	Percent Accomplished to Date
1. 2500 additional Ha. irrigated for production of non-traditional crops	2,500	2,503	100%
2. CENTA extensionists:			
a) extensionists trained	136	229	168%
b) providing services to farmers	50	69	138%
3. CENTA researchers trained & incorporating irrigated agr. into CENTA research	40	34	85%
4. Curriculum for B.S. degree in irrigated agriculture at ENA	1	1	100%
5. ENA staff trained and teaching:			
a) 4 M.Sc. degree	4	2	50%
b) Short term	34	26	76%
c) Teaching	26	26	100%

QUANTIFIABLE INDICATORS AS OF 09/30/89 (Continued):

Indicator	Quantity Planned	Quantity Accomp. to Date	Percent. Accomp. to Date
6. DGRD planners and technicians trained and carrying out more cost/effective irrig. proj. planning and contracting/supervision of pub. irrig. construct.	54	40	74%
7. OA and OSPA planners trained and carrying out more balanced planning of water resource use for agr.	22	19	86%

Aside from these indicators of project progress, it is also estimated that at least \$17,692,000 U.S. has already been generated by this program, and that, as of March 1990, over one million person/days of work have been created.

Although the project has been witness to these rather impressive quantifiable increases in short-term training output, the evaluation team also noted some problems in terms of the quality of the training being dispensed. Examples cited include: the scarcity of written course material and information on course content; a lack of attention to areas other than irrigation which influence production (i.e. drainage, fertility, plant spacing, etc.); the need to further accent the economics of irrigated agricultural production; etc. On a larger scale, evaluators also note a need to spend more time on the development of an information transfer strategy. This includes: making available better written material on irrigated crop production and management; multiplying the number of demonstration plots used in trainings; and organizing and conducting the longer term trainings (12 weeks) in irrigation and the six policy seminars called for in the PP. To develop the best strategy possible and meet the need for more and better information that the project has created, the evaluation team further suggests that in-depth training needs assessment be conducted.

Other factors also continue to hinder the project from realizing its full potential. Such factors include: recurring administrative problems (i.e. delays in the approval of annual work plans, staffing levels, budgets, and operations); continued political disturbances which erode confidence in rural investment; and a continued lack of coordination between public and private sector activities.

Another important factor hindering project progress, relates to the poor quality of oversight and assistance provided by the technical assistance contractor's home office. Results of this include: delays in the arrival of essential equipment and inadequate transportation has caused inconveniences which have added to overall project costs; delays in payments to technical assistance field personnel; field personnel spending inordinate amounts of time on financial and reporting aspects of the contract; reduced use of badly needed short term consultants. Not only has this had a direct effect on project achievement, but also an immeasurable negative impact on the morale of long term contract employees and their families.

Aside from the above problems, and perhaps more important to project success, it is clearly taking more time to change the attitudes of farmers and technicians and create local expertise in irrigation than had been originally envisioned. Given that prior to this project, experience in and knowledge of irrigated export agriculture was extremely limited, especially among public agencies, this is not surprising. So while it is true that through intensive training more farmers than ever before are interested in learning how to use irrigation for growing export crops, the project is still far from realizing its potential or fulfilling the long-term needs of the country.

As a response to the above, the following recommendations are advanced:

1. Continue the public sector component of this program for five more years. The basic concepts and tenets of the original PP are still valid.
2. Increase foreign technical assistance during the five-year period in No. 1.
3. Improve and formalize coordination between agencies involved in the project, especially between the private and public sectors.
4. Focus more on the production of high value and employment generating crops with irrigation, rather than on irrigation per se.
5. Further strengthen the training program at all levels, particularly at ENA, adding at least five M.Sc. scholarships during the next five years.
6. Strengthen the formal and informal linkages between packers, processors, technicians and farmers.
7. Terminate the DIVAGRO/FIDEX element of this program. The main elements covered by this project (519-0303) will be continued under the 519-0327 Project.
8. To best meet the expanding interest in irrigation and need for additional training (local and abroad), and as an initial step in developing an information transfer strategy, conduct an in-depth training needs assessment.

SECTION ONE:

EVALUATION OF THE EL SALVADOR WATER MANAGEMENT PROJECT

A. Pre-Project Overview

Due to the strength of the world economic situation and strong trade within the expanding Central American Common Market between 1960 and 1978, El Salvador's economy grew by an impressive 5.4%. Much of this was the result of expansion in the urban industrial sector, but agriculture GDP also increased significantly.

At the beginning of the 1980s, the economic situation of the country began to slide. From 1970 to the mid-1980s, agricultural output declined by 18% and rural unemployment increased, from 55-60% in the 1970s to over 75% in the 1980s. The GDP began to decrease at a rapid rate due to an increase in both the world and El Salvador's interest rates and diminishing markets abroad for the major traditional products that the country produced. In addition, the loss of two of the country's major commercial partners within the Central American Market -- Nicaragua and Costa Rica -- further complicated the financial situation.

At the same time, within El Salvador other factors were further straining development potential. Population growth was over 2.4%, among the highest in the hemisphere. In addition, there was (and still is) an extremely high rural population density of over four people per arable hectare. There also existed high expectations for development. These factors collectively presented the government with formidable handicaps and pressures for sustained growth.

Unfortunately, all four of these factors -- population growth, lack of development capital, increasing interest rates, and the breakdown of markets for traditional products -- began to come together to the detriment of the national economy. On top of these major development complications, the growing insurgency, with destruction of private and public property, and the measures that the government found necessary to counteract the political situation, depressed private sector confidence and investment.

Based on the last ten-year average, the agricultural sector is said to have generated 23% of the GDP, more than 50% of the employment, 60% of the foreign exchange earnings, and most of the basic food production consumed in this country. A large number of perishable crops that could be grown locally are imported into El Salvador from Guatemala. At the start of this program it was estimated that the equivalent of 7,000 Ha. of vegetables and fruit were imported from Guatemala.

The area of good soils suitable for irrigation in El Salvador is conservatively estimated at 349,000 Ha. An estimated 172,500 Ha. are said to have potential to receive adequate water supplies from surface sources of water using furrow irrigation. These estimates are based on studies of soils, topography and, the most obvious, hydrology. With pressurized irrigation, steeper slopes and larger areas can be brought into production. Large additional areas can be brought into production using shallow wells. The extent of the area that can be served from this sources has not been well-defined. Current studies indicate adequate annual recharging of these aquifers is taking place, which makes this mode of irrigation a real possibility.

The area with existing infrastructure for irrigation is estimated to be approximately 38,500 Ha., of which 45% is actually irrigated. This difference is reportedly mainly due to poor maintenance of existing systems. Eighty-four percent of the land that is actually irrigated is used to water pastures; 11% is used to irrigate sugar cane and coffee, and less than 5% used for non-traditional crop production. These figures are considered unreliable due to the lack of good statistics on water use in this country.

In later 1984, as a result of an in-depth evaluation of the rural situation, the government of El Salvador and USAID began to discuss what could be done. It was agreed that the main focus should be on defusing the immediate situation, if possible, on a "crash" basis. The focus of this new effort was on increasing employment, foreign exchange, and use of irrigation for producing crops for export sale and for national markets. It was also agreed that it was most practical to focus efforts in the private sector, where there was already limited experience in producing and exporting fruit and vegetables.

In addition, GOES and AID recognized a need to further strengthen several government agencies so that they could more effectively and efficiently address the total irrigation needs of the country on a long term basis. GOES and AID felt that it was necessary to introduce improved policies, overall irrigation planning, improved irrigation system design, water management, and irrigated crop production. It was also deemed essential to incorporate irrigation technology into the educational system so that future Salvadoran technicians could assume full responsibility for this activity. Farmer training must be a priority of the program.

An eight-member, highly qualified team of experts arrived in El Salvador and began to develop the Project Paper. The team included specialists in the critical areas needed to properly design this new effort. Field work was completed and AID authorized the Project on August 26, 1985.

B. Project Design Strategy

The role of irrigation in El Salvador is not the same as in an arid country where basic production requires water. El Salvador can produce much of its basic food needs, as well as some of the products that it exports, rather easily using existing rain-fed land resource systems. Nor is irrigation needed on a priority basis to expand production in traditional export crops, although irrigation can increase some of these yields significantly.

The design team noted that the need and potential role for irrigation is relatively narrow in El Salvador, yet very critical. They felt that the program should focus on diversifying export crops during the profitable export window from November to April, when there is high export product value. This coincides with the dry season throughout the country. These largely perishable products are labor intensive, and with good production methods, they have extremely high value and a good seasonal or year-long domestic or foreign market.

The Project's strategy was to accelerate the training and transfer of cost-effective technologies in irrigation and irrigated agriculture to national technicians, and through them to farmers. This required training, establishment of an agile credit mechanism, and expansion of the area under irrigation using existing river water or exploiting underground aquifers. This would increase the nation's effective land area under intensive cultivation, as well as expand the penetration of export market channels for fresh and processed products.

The Project was designed to address the major constraints both in government institutions and in the private sector in irrigation technology, crop production, education, water use, water systems design and management, irrigated crop production, improved harvest methods, and export marketing. The objective is to educate and stimulate both individuals and public and private sector institutions and technicians to develop efficient water use for crop production, augment the sale of crops in either local or export markets, and expand support to those engaged in the sale of inputs and services to the system.

C. Project Description

The Goal of the Water Management Project is to generate employment, income, and foreign exchange for El Salvador. The Purpose is to promote and stimulate diversified irrigated farming in El Salvador through institutional strengthening, technology transfer, training, and credit assistance.

Project activities are divided into two segments: (1) Support and lending to private sector firms engaged in or directly connected to intensive irrigated agriculture and export marketing R&D; and (2) support of public sector irrigation planning, extension, and

training institutions to provide improved assistance to farm-level water management and irrigated agriculture.

D. The Private Sector Component

The objective of the private sector element of the project was to strengthen the technical and financial abilities of private firms and farms to use water from rivers, streams, and aquifers for producing, processing, and marketing high-labor non-traditional export crops. Funds were also made available for new processing and packing plants to serve as the "pull" factor through increased marketing of perishable crops.

The Salvadoran Foundation for Economic and Social Development (FUSADES) was selected to be the private sector grantee and coordinator of all private sector activities. Its functions were to support private sector irrigation associations in carrying out a range of activities that would expand non-traditional exports, and to help the associations obtain legal status and organize their operations.

A Private Sector Irrigation Association was formed in 1985 at the urging of the USAID, with the support of FUSADES. The association members were to include leaders from irrigation equipment suppliers, irrigated agriculture consultants, farmers, and marketing firm representatives. Under the original project's design, the association was programmed to carry out a number of functions as soon as it was legally recognized by the government.

The association was not expected to administer any element of the program. Its role would be to interest potential national investors in irrigated export crop production; operation of processing plants, canneries, and freezing plants; and marketing of products developed in foreign countries. During the first several years, the association would assist the investors in preparing feasibility studies and securing loans, and would offer advice on the best production practices and training in all phases of the new venture. Senior U.S. technical advisors would be available for short periods to train staff of the pilot plants and farmers receiving loans for irrigation systems.

Two types of loans were to be used to finance private sector activities. The first, the "Model A" loan, was to be given to private farmers for irrigation equipment -- pumps, tubing, hoses, etc. The second, the "Model B" loan, was for the purchase of packing and processing equipment, construction of buildings, and operating capital. The "Model B" loan also included the purchase of irrigation equipment and supplies by the packer or processor for the production of crops to supply the packing and/or processing plants.

Originally, the "Model A" loans were to total \$1,500,000 and the

"Model B" loans were to total \$8,500,000. In 1988, USAID increased the total amount authorized for lending to \$10,750,000. At the same time, USAID removed the restriction on the amount that could be lent under the "Model B" type loan.

E. Public Sector Irrigation Development

The objective of the public sector component was to strengthen public sector institutions engaged in or affecting irrigated crop production for export. This included training and technical assistance for irrigation planning, programming and monitoring irrigated crop production, harvesting, and marketing in order to improve government activities in these areas. The institutions that were to receive project assistance were the Agricultural Technology Center (CENTA), the National School of Agriculture (ENA), the General Directorate of Irrigation and Drainage (DGRD), the Agricultural Sector Planning Office (OSPA), and the Office of Water (OA).

The public sector planning institutions -- OSPA, OEDA, and DGRD -- were to be assisted through U.S. short and long term technical assistance, equipment, visits to water districts in other countries, national and foreign short courses, and workshops. The intent was to improve their ability to design, organize, operate, and transfer these systems to the water users. They would also be assisted in updating and modernizing the current water law, and developing and analyzing new alternatives for future water policies.

CENTA and ENA would receive U.S. long and short term technical assistance, equipment, and local and foreign short and long term training to upgrade their capacity to train farmers, agronomists, and extension agents in irrigation and irrigated culture. CENCAP was chosen as the site of numerous short courses for farmers and extension agents.

The total cost of the project over a five-year period is \$25.2 million, of which AID is to provide \$5.3 million in grants for public sector activities, and \$13.5 million to the private sector. Ten million dollars of the private sector grant from AID would be deposited in the BH and operated as a R&D credit fund. An additional \$2.5 million in local currency would be made available from the PL-480 program. The public and private sector institutions would contribute approximately \$3.9 million as in-kind contributions. The expected life of the project would be five years.

F. Other Evaluations and Project Modifications

As noted in the previous Project evaluation, since the project began, several modifications have been made by agreement between FUSADES and AID, to increase the efficiency of the program or to

overcome deficiencies in the original design. During the first two years, these modifications included:

- (a) Increasing the level of commitment at which FUSADES must secure AID concurrence on proposed long term contracts, from \$20,000 to \$50,000.
- (b) Delegating authority to FUSADES for determining a client's loan worthiness: Under the original project design, FUSADES was given the responsibility of creating the loan committee that would review all feasibility studies and recommend the approved irrigation projects to the BH for lending. The BH would review the credit-worthiness of the potential client and, if approved, would disburse the loan from the trust account of the program deposited in the bank.

After the approval of the program, it was learned that GOES banking regulations require that trust funds have a cash reserve of 30% of the fund. In order to not tie up over \$3 million in inactive reserve, by mutual agreement between USAID and FUSADES a commercial account was opened and FUSADES, through its loan committee, assumed responsibility for not only the approval of the feasibility study but the credit-worthiness of the potential client as well. At such time as the association was legally created, this responsibility would pass to it.

- (c) Removing the USAID representative from the FUSADES loan committee: AID had a representative on this committee under the original organization of the project. As it was deemed to be counter to USAID policy, this representative was removed in October 1987, and FUSADES reorganized the composition of the loan committee.

Changes made after the first evaluation of November 1987 include:

- (a) Responsibility for the management of credit and technical assistance programs was delegated to FUSADES in lieu of The Corporation for Agricultural Irrigation and Export (CORPREX).
- (b) The limit on the number of "Model B" projects was removed and the AID contribution to the loan portfolio was increased from \$10 million to \$10.75 million.
- (c) Furrow irrigation and land leveling equipment, etc., were made eligible for financing under the program.
- (d) FUSADES' authority to sign contracts of up to \$100,000 without prior AID approval was granted.
- (e) The PP condition that input suppliers be responsible for up to 20% of the bad debts for equipment was removed.

- (f) A stipulation was made that loan recipients must personally contribute at least 25% of the cost of items purchased with FUSADES loans.

SECTION TWO

SCOPE OF WORK, TEAM COMPOSITION, AND METHODOLOGY

A. Scope of Work

1. Overall Evaluation Team Guidance

After reprogramming the Project following the first evaluation in late 1987, the private sector component has progressed considerably and the mission feels that it will be completed as programmed. The Agribusiness Project (519-0327) has also incorporated follow-on activities for the private sector. Thus the evaluation of this element will primarily assess the impact of its various activities and identify lessons for consideration in future project design.

In USAID's opinion, the public sector component has not progressed as well. It has continued to suffer from both delays in implementation and failure to implement various activities as designed. At this point, it is clear that this component will not be completed as programmed by the PACD. In this regard, the purpose of the evaluation will be to assess project progress in all of its various activities to date, and to determine if they should be reprogrammed under present and expected circumstances. Special emphasis should be given to the ability of public sector entities to carry out their expected roles in light of budgetary and administrative constraints. If reprogramming is indicated, the evaluation team should set forth recommendations in clearly articulated actionable statements.

2. Scope of Work

The evaluators will carry out the tasks, address the issues, and provide answers to the questions set forth below in the context of the evaluation as described in section 1. These tasks, issues, and questions are considered essential but not definitive, and the evaluators will be expected to investigate any others required to accomplish the purpose of the evaluation.

3. Evaluation Issues

The evaluation team was asked to focus its investigation on a set of issues that were prepared by the USAID Rural Development staff. This consisted of seven questions for the public institution component of the program, and six questions directed toward the private sector. The assessment of the progress and problems was to be based on the progress of the program since the first evaluation in 1987. This team's issues, observations, comments, and recommendations are contained in the following section of this evaluation.

B. Team Composition and Assessment Methodology.

The evaluation team is composed of two experienced agriculturists with considerable background in the design and management of irrigation and perishable crop production programs in a number of countries, as well as rural development planning and evaluation expertise.

Upon arrival in El Salvador, the team reviewed the scope of work with the Rural Development staff and the Project managers, to seek guidance on the overall assessment objectives and methodology. The team was provided with pertinent background material from both the AID files and those of the public and private sector agencies. The evaluation team was also provided with quantitative and descriptive information by both the public and private sector agencies.

The team received the full cooperation of the USAID staff, the GOES public sector agency staff participating in this program, and the personnel of the FUSADES/DIVAGRO. During the first week the evaluators attended all meetings together. During the second week, the team divided the work, with Dr. Hargraves assuming responsibility for assessing the progress and problems related to the training and research component of the program. Mr. Fiester concentrated on assessing the progress and problems of the private sector agency DIVAGRO. More than ten meetings were held with the personnel of the public sector, and nine meetings were held with the private sector agency staff. Sixty-six people involved directly or indirectly with the Water Management Project were interviewed either individually or in groups. In addition, 13 farmers and processors were met (see Annex No. 1 for list of people contacted).

This evaluation team went to the field for three days. We visited private and demonstration farms as well as a sample of the processors with FIDEX loans or DIVAGRO technical assistance contracts. We also viewed the work in the field guided by the public sector. We discussed progress and problems with participating farmers, field program management staff, regional supervisors, and field extension agents, and saw their irrigated demonstration fields and the cultivation of irrigated crops on private farms assisted by them.

Though we were accompanied by the USAID backstop officer Ing. Rodolfo Cristales to most of the meetings of the public sector agencies, he did not participate in our discussions. We are indebted to him, to Mr. Clem Weber, and Mr. Wiland Gunderson of USA, Inc., for sharing their understanding of the events that led up to this program and the background of the different institutions with which were worked.

SECTION THREE:

EVALUATION FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This section presents findings, conclusions, and recommendations regarding the issues assessment. Each issue is addressed separately. The presentation begins with a statement of the issue developed by USAID. It is followed by a discussion section reflecting our findings on the issue, our general conclusions, and our recommendations.

PUBLIC SECTOR COMPONENT

ISSUE #1: Assess the Project's effectiveness in providing training, technical assistance, and equipment to improve irrigation planning, monitoring, and evaluation. Also, evaluate the impact and utilization of these inputs. Activities pertaining to training, data base development, studies, and analyses must be addressed.

(a) Discussion

As noted in the previous evaluation, there was relatively little coordinated training, technical assistance, or adequate equipment for carrying out this Project during the first two years of its operation. Progress was slow and the interest and aspirations of those involved were not fulfilled.

The technicians in all of the participating government agencies came from ENA or university training programs at the Agronomo or Ingeniero Agronomo level. They were not prepared in these courses in the production of intensively grown, often perishable crops, nor in modern systems of irrigation. Likewise, the farmers had almost no previous experience in growing crops with modern systems of irrigation, nor knowledge of the requirements of the export market.

It has not, and will not, be easy to change this traditional approach to agriculture, give technicians a new view of the problems and potentials of irrigated agriculture, and take advantage of this nation's water use and abundant labor for farm-level production.

The U.S. contract technical assistance team, on its arrival in November 1987, began to work with ENA on a graduate course in irrigated agriculture. In addition, the expatriate advisors, after discussion with their counterparts and the USAID, organized a rather comprehensive training program to better prepare national program leaders, administrators, extension agents, and program technicians in the various aspects of policy development, water use diagnostics, proper design and use of irrigation systems, irrigated crop production techniques, harvest methods, pest management, and similar subjects.

Starting in January 1988, the U.S. advisory team held twenty-seven short courses in 1988 and thirty-four courses for the public sector agency's staff in 1989. The number of people trained during 1988-1989, and the agencies from which they came, are as follows:

<u>AGENCY</u>	<u>NO. OF STUDENTS</u>
CENTA	103
CENCAP	10
ENA	34
DGRD	27
OEDA	3
OSPA	11
EXTENSION (REGIONS)	255
OTHER	51

Total people trained:	494

During this period, they have given 61 short courses, most of which were less than one week long. These include training in the following categories:

<u>TYPE OF TRAINING</u>	<u>NO OF COURSES</u>
1. Practical Irrigation	11
2. Research	2
3. Diagnostic Methodologies	2
4. Planning (including on-the-job training)	11
5. Extension Techniques	12
6. Agribusiness/Post Harvest	6
7. Evaluation	2
8. Production	15

Total Courses:	61

In statistical terms, this team of advisors has trained in only twenty-four months the expected load of the entire four-year assistance program. Carrying out and participating in so many training sessions (some were carried out by OCOPROY, DGRD, and other institutions), in addition to their work at ENA, is a measure of the staff's dedication.

We have noted that the practical inability to bring in all of the outside consultants to El Salvador as originally planned in the PP appears to have reduced the technical and experience level of the instruction of some of the courses. These five long term advisors could not be expected to cover all of the training needs of the participating agencies at the level comparable to high-level specialists outside the country. This is especially true for high-level planners with irrigated agricultural experience, vegetable

crop specialists, water legislation specialists, etc.

It should be noted that 33 technicians from several agencies went to Guatemala to view work in non-traditional agricultural production, processing, and marketing. Similarly, in 1989, 36 individuals went on these training trips to Guatemala, including 8 farmers. There was considerable uniformity in the value of this training. Some felt that it was more valuable than visiting the DIVAGRO demo plots since the latter were of too high a level of technology for small farmers or the technicians working with them.

In another vein, during our visits to the field (we assumed that we were shown the better examples of their work), we noted that the soil preparation, the lack of uniform moisture penetration of furrows and wetting of ridges, the lack of uniformity in the germination of the crop, inadequate nutrition, etc., were less than satisfactory for producing high yields and high quality products. This was true in both farmers' fields and the demonstration plots. This indicated that either the courses are not giving adequate hands-on experience to the extension agents, or they are not transmitting the information effectively to farmers.

Various public sector agencies repeatedly told us that, except for CENTA and ENA, advisors were not giving enough time to the other agency requirements in training. They wanted more in-depth training in planning, management systems for the operation of irrigation districts by producers themselves, and technical and economic evaluation of alternate water management systems. We also noted that they had not developed an effective and efficient extension system for transferring information to large numbers of farmers on a consistent basis (possibly biweekly for annual crops). Nor did the agents seem to have the latest information on the production of the individual crops being grown. Regarding the training program, more learning experience is needed in the use of hydrometers and similar test equipment by the field extension agents and DGRD staff, to improve both the planning of irrigation systems and their operation.

During discussions with all of the different agency heads of this Project, we were repeatedly told that the technical capacity and experience of the advisors in their fields of specialization was excellent. They were highly regarded for the amount of effort that they put into their assignments (most did not know of the economic problems they faced from time to time). Some felt that one or two of them were trying to do too much and consequently had no time to discuss progress and problems with the heads of these agencies.

A review of the equipment that the program has supplied shows that most of the transport (50 motorcycles and 34 vehicles) has been provided to the public sector agencies. This equipment appears to be well used and serving its purpose in the program. In addition, 34 computers have been delivered to the program (two are at USAID)

and have been distributed to all of the participating agencies including the four extension regions. We saw this computer equipment in use. Most agencies wanted more training in the use of computers and the input of data to the system.

We note that some of the equipment planned for this program has not been ordered or delivered to date. This includes 60 Has. of drip, sprinkler, and micro systems to be used for research and teaching, which has not yet been ordered for CENTA.

In addition, \$20,000 worth of library publications on subjects related to irrigated agriculture has never been ordered for the libraries, nor has essential equipment been ordered for the soils laboratories. We note that only two of the scholarships at the M.Sc. level have been filled (we were told by USAID that they had not approved several of the applicants because of their inadequate qualifications).

Several publications have been drafted but not published by CENCAP, since it did not receive funding from CENTA for this purpose.

Only twenty person/months of the programmed 54 person/months of short term technical assistance has been used. In part, this appears to be due to lack of confidence in U.S. support. Nevertheless, it has adversely affected the training program. Use of this type of advisor could have complimented the work of the short term expatriate advisors in vegetable production, computerized irrigation system design, irrigated agricultural production planning, post harvest and food technology and field vegetable production, quality improvement, and water use assistance to farmers. Unfortunately, due to management problems only one of the six planned intensive training courses (six weeks per course) was carried out.

The computers were ordered in early 1989. Changes in the specifications were made mid-year and the equipment was delivered just before the election. It was finally installed in the participating agencies in January, 1990. Mr. Gunderson and colleagues in OSPA, OBDA, DGRD, and AID developed a set of data bases to design and plan annual and longer term projects in this area. The system will also enter climatic, underground water data, market information, and permit measurement of the progress and results of individual and overall water projects as they affect the country and the farmer.

Since the equipment for the data system was installed, at least two people from each organization have received courses in the proper use of this equipment and the data system itself. Additional people are being trained in these procedures at this time. Data for climatic and water aquifers, costs per area, income per area, and labor (by crop and area) of producers in the four regions are being inputted. As this system becomes more complete, it will

become a very valuable tool for planners, project designers, extensionists, and others.

We noted that the data that is now being inputted is still not very uniform. Review of the manner of collecting data is warranted. Since the main computer memory at OSPA is only 80 megs, additional memory will be needed. Consideration for increasing this to at least 200 megs should be given soon. U.S. market data being received by DIVAGRO should also be added to this system.

The Project has made considerable strides thus far. In the last two years, it has trained several hundred GOES people in a variety of courses. It has completed a diagnosis of the water situation as it relates to irrigation and water availabilities. It has developed a first comprehensive water law review, so that a new perspective is possible on modernizing legislation relating to water use. A draft water law is now being developed. For the first time, a comprehensive annual work plan has been developed and is being used to guide all of the participating agencies' action plans within this Project. A coordinating office has been created by the government, to manage the evolving public system.

Probably the most important progress has been made in the field. Where two years ago there was little irrigated production for export on small farms, there are now reportedly over 3000 Mzs. being assisted by the extension service. This is in spite of the major setback of the insurgency of November and December last year, the best part of the export season. Undoubtedly some of this reported area is not really under irrigation at this time, but the figures are still impressive to us even if only half correct.

We were equally impressed by the desire to learn and enter production by farmers not now in the program. There is definitely a new interest in this program in the rural sector. As some make good profits from exports, more farmers will want to get into the business. There is room for this in the short term, since there will be excess processing capacity to be filled next year. We hope that the training between now and October 1990 will focus on the defects of the production system, so that better results will be achieved on small and medium sized farms next year.

Looking to the future, it is evident that the basic precepts of this program are, and will be, valid for some years to come. Irrigating only two thirds of this country's estimated potential for intensive crops will create at least one million person/years of work in the rural sector annually. We know of no similar single activity that can match this for El Salvador. Markets, export and domestic, exist and the technology for broad processed product development is now in-country or can be imported. It will permit much higher average incomes for farmers than corn and beans. It will permit more people to buy the things that they need for better living. This will stimulate both agriculture and industry. The cost

of creating a rural person/year of work is usually about one-fourth to one-sixth that of an urban job.

On the basis of the above precepts, we strongly propose that this effort be extended for an additional five years. This would permit USAID to continue to build on the investment made during the past two years, the growing interest of farmers, and the improving capacity of national technicians and institutions. We feel that five years are justified on the basis of potential, the loss of almost two years at the beginning of this effort, and the major setback during the last winter season caused by political problems. It is essential that additional time be given to this effort to really solidify the gains made to date and improve the use of proper individual crop-related technology. Time will also be needed to build a cadre of seasoned professionals in this country that can continue this effort after the U.S. assistance terminates. Too often AID terminates a project before it arrives at full operational effectiveness. We hope that this activity does not fall into that category.

In developing the plans for an extension, if one is made, we propose that USAID and the GOES consider certain changes in the number and qualifications of the technical advisory team in the future. We also suggest that other inputs be considered. In this context, we suggest the following:

- (a) Two extension technicians specializing in modern vegetable production, to work with the extension service and CENTA (ten person/years), working in two regions per person.
- (b) Greater technical support for the extension service -- at least one full time person specializing in information transfer and mass media (four years) to assist in preparing mass media programs, extension publications, and training agents in efficient transfer methods to large numbers of farmers in irrigated agriculture.
- (c) One person should continue in small and medium-sized private and group-operated irrigation system design and management (five person/years); another full time advisor in educational support to ENA (five person/years); and a pest management specialist will be needed (three person/years).
- (d) Upgrading the technical skills of the staff of the soils laboratory of CENTA through foreign and on-the-job training in more rapid systems of soil analysis, foliar analyses of minor elements, development of improved correlations between soil and foliar analysis for intensively grown crops, and fertilizer field response. (One person in repeated visits totaling one person/year.)
- (e) Approximately thirty person/years of short term technical

assistance in planning, economics of production and marketing, improvement of management in existing and new irrigation systems, post harvest methods, seedbed preparation, research, etc.

(f) During the extension of this program, the planners and technical staff will require additional training. This should include:

- (1) At least 20 courses of 1 to 4 weeks duration per year for key technicians, covering topics such as: program strategy development and planning, technical aspects of intensively grown crops, small and medium sized irrigation system management, pest control, grades and standards, EPA regulations, post harvest product handling, and marketing.
- (2) In-depth training of at least ten DGRD and extension service technicians in the U.S. in organization, management, and operation of small and medium-sized irrigation systems by farmers, with emphasis on furrow irrigation districts.
- (3) More training at all levels is needed in the use of computers -- especially for those involved in the use of and input to the data bank, word processing, and monitoring program progress and planning.
- (4) Additional equipment is needed to replace vehicles, motorcycles, etc. that will wear out during the next several years.
- (5) Additional equipment is needed to increase the memory of the data bank's central unit, and measure water use and soil humidity by the extension agents; additional funds are needed for improving the number and types of publications available from other sources for the libraries at ENA and CENTA (if not merged) and the extension service on all phases of vegetable production by irrigated systems and their operation, crop production, harvest technology, food processing, seed sources, etc.
- (6) Two computers are needed by GEMA to automate their financial records and maintain project inventory.

b) Conclusions

- 1) The late arrival of the U.S. technical team and the support that was to be provided through them, almost two years after the program started, caused considerable delay in training key technicians in the public sector

at all levels.

- 2) The progress in short course training provided by the technical assistance advisors, short term consultants, and the Project's own public agency instructors has been impressive since the last evaluation, in spite of a range of problems. Most of the original quantifiable indicators of the PP have been attained.
- 3) The technical advisory team has provided less support for improving planning, coordination, and extension technical capacity, and developing a sound and effective technology transfer system or improved farmer marketing system than for ENA's training program and CENTA's research program.
- 4) The long term and short term technical assistance has been of good quality and the technical staff is highly regarded by national technicians and institutions. A higher level of assistance from the USA, Inc./AGRIDEC team and short term advisors hired through them is requested by several participating agencies.
- 5) OSPA, DGRD, OEDA, and CENTA have improved their understanding of irrigated agriculture, strengthened their planning and design of small and medium-sized irrigation systems, and clarified their institutional roles as well as their assistance to farmers.
- 6) Apparently due to the lack of adequate applied experience in soil preparation, furrow irrigation, and vegetable production during training of extension field agents, they have not transferred -- or at least farmers are not using -- the best technical and operational systems required for outstanding production, product quality, profit, and efficient use of water.
- 7) Some of the essential technical assistance and equipment has not been provided as called for in the PP. This has adversely affected the efficient use of the technical assistance and the effectiveness of the training programs for all of the GOES agencies. It delayed their use in developing the basic information needed to plan, monitor progress, and evaluate the impact of the program.
- 8) The Salvadoran institutions appear to be making good use of the supplies and training that the program has provided.
- 9) In spite of the country's political difficulties and the Project's problems, it has a major impact on rural interest in non-traditional exports and causes

institutional and attitudinal changes within the GOES.

- 10) In continuing this Project, additional technical assistance will be needed; more training of national personnel both in-country and in other countries is indicated; and additional equipment will be required.

c) Recommendations

- 1) This Project should be continued for an additional five years to take full advantage of the progress, investment, and growing farmer demand for assistance in intensive crop production. The program's basic focus on employment generation, high income per area of land, and mode of operation are still extremely valid.
- 2) Outside technical assistance should be continued. Changes in the composition and mode of operation of this team to better respond to the future needs of the institutions, technicians, and farmers involved are warranted.
- 3) Additional training at all levels must be continued. This must include both in-country and foreign training. Local courses should include more applied field experience for the participants. This is true for ENA as well as the training of extension agents and, through them, large numbers of farmers.
- 4) Additional equipment will be necessary to replace old vehicles and meet new needs if the program is continued.

ISSUE #2: To what extent have the in-country training courses for public sector technicians and professions, particularly extension agents and researchers, and the seminars for policy makers been carried out? Have the contents of the training activities been appropriate and have the right people participated? What has been the impact and what impact might be expected over the long term?

a) Discussion

Sixty-one short courses were given during 1988-1989 for 494 professionals, technicians, and policy makers. Nearly 1,000 participant weeks of training were provided. The training was approximately 64% related to irrigation practices, 20% to cultivation practices, 12% to research and training methods, and 4% to perishable commodity commercialization. Minimum use was made of printed instructions and hand-out material. The personnel trained were approximately 52% from the four regions, 22% from CENTA, 10% from DGRD, and 6% from ENA, with the remainder from various other public institutions.

Due to the scarcity of written course material and information on course content, it is difficult to assess the appropriateness of the course presentations. There does seem to be an indication that irrigation may have been considered the most important factor of production. More attention to drainage, fertility, plant spacing, and research on interactions influencing crop yields seems to be needed. Greater emphasis is needed in the field application of the technologies taught in the classroom, and further accenting the economics of production will pay great dividends.

Major emphasis was given to training extension agents. The agents need not only training but a much-improved source of written material on irrigated crop production and management. This is needed not only for training, but to reinforce the training of farmers by extension agents.

The Grant Agreement states, "An intensive technical irrigation course will be developed and offered six times during the life of the Project." Of the 61 courses mentioned above, there was only one irrigation course which lasted 11 weeks, and another which lasted 6 weeks; the others lasted one week or less.

An intensive 4-week irrigation course was given in 1987 by professors from the International Irrigation Center of Utah State

University. Micro computer training was provided, as well as design, scheduling, and management of surface, sprinkle, and drip irrigation. There was good use made of training materials in Spanish. It appears that a course at the level anticipated in the Grant Agreement was given only once.

The Grant Agreement also requires 6 policy seminars of 1 week each, with attendance of "key executives" from 6 GOES agencies. No record has been found of any compliance with this requirement.

b) Conclusions

- 1) There has been a good effort to meet the short term training requirements established in the Grant Agreement.
- 2) It appears that appropriate people were sent to most of the short courses, and they found these very useful.
- 3) There was apparently little effort taken to carry out the longer term training (12 weeks) in irrigation seminars and courses, or the six policy courses called for in the PP.
- 4) The lack of published material on the content of each course makes it impossible to evaluate the quality of each training event.

c) Recommendations

- 1) Require that course lecture notes be printed and filed at OCOPROY, to serve as valuable tools to evaluate course content and prevent overlap among future courses.
- 2) Provide extension agents with written instructions, production guides, and other suitable materials to be used in training farmers in the irrigated production of non-traditional crops.
- 3) Researchers and extension agents must identify the major factors that influence crop yields, product quality, and profitability of different types of vegetables produced for export.
- 4) An extension of the project should include the required intensive irrigation courses and policy seminars.
- 5) More emphasis should be given to training ENA's professional staff.

ISSUE #3: With regard to participant training programs (i.e., those outside El Salvador), determine the extent to which they have been carried out; determine whether the participants are appropriate; and determine whether the selection of participants and administration of this activity can be improved.

a) Discussion

In 1985, a total of 83 participants were trained at the International Irrigation Center (IIC) at Utah State University in 5 short courses lasting from 3 to 6 weeks. Six more participated in 1986, 2 in 1987, and 8 in 1989.

Sixty-three participants have received one week of training in Guatemala in management, crop processing, and marketing. Two received a week of communication training in Costa Rica. Seven went to Miami for 2 weeks for agro-industrial training, and 3 studied computer operations related to the data bank in Las Cruces, New Mexico, for 1 week.

The Project Paper proposed M.Sc. level training for professionals from ENA in irrigation agriculture, tropical plant pathology and entomology, rural organizations and extension, and agribusiness management. Of the four programmed in the PP, one is now studying agricultural extension at Chapingo, Mexico, and one is studying plant protection in Monterey, Mexico.

Lack of proficiency in English has been mentioned as a reason for not making more use of international training. However, the potential training in Spanish has not been well exploited. Some

U.S. universities teach short courses in Spanish, while others start students in intensive English studies before beginning their formal education.

Satisfactory M.Sc. training can be arranged for students who do not have the ability to learn English, for some types of courses in Mexico and Puerto Rico. Not all of the potentially best students speak English. The Project should have investigated these training sources more aggressively so that all of the programmed scholarships could have been used.

Training in English for ENA staff would greatly facilitate the transfer of modern technology related to irrigated agriculture, and especially irrigated crop production. The director of ENA expressed a desire to send additional participants for the M.Sc. degrees in agroindustry, post harvest technology, soils, and fertilization. A specialization in olericulture and/or crop science might be added to their list.

All of the out-of-country training seems to have been well received and beneficial to those who attended. We were informed that the one-week field trips were very educational and not too expensive. They learned a great deal from the work that is being done in research and production on a wide array of vegetables being grown at low and high elevations. Those who went on these trips felt that they gained a better perspective on what can be achieved in El Salvador, as well as the quality of the competition. One person felt that these visits were better than visits to DIVAGRO demonstration plots, since these plots are too advanced for most of the small and medium-sized farm operators that they work with.

The U.S. training was thought to be excellent. The participants felt that they learned a great deal from the topics presented, as well as other related observations made in the field. They did say that they wished to learn more about U.S. markets for both fresh and processed commodities. They hoped that in the future they will be able to observe these outlets firsthand, and discuss their products' reception in comparison with those sent by other countries.

A list of short courses programmed for the Project in 1990 is attached as Annex No. 2.

b) Conclusions

- 1) The Project could have benefited considerably from increased M.Sc. training, and from more short term international training.
- 2) The full number of participants from ENA has not been sent for training. This will reduce the school's ability to train others at the desired level of expertise needed

in the future.

- 3) A lack of proficiency in English is given as a reason for not proposing more people for scholarship abroad. This can be overcome through English courses in this country for prospective participants, or by sending them to institutions out of the country which teach in Spanish.

c) Recommendations

- 1) The Project should consider providing support for English language training in El Salvador. This would be particularly valuable for ENA professors and candidates who are to be sent abroad for training. It would be useful for other technicians, since most of the best research is published in English.
- 2) Financial support for a minimum of five participants at the M.Sc. level is recommended. The preferred location is in the U.S.
- 3) Use the short courses offered in Spanish by universities and consulting companies in the U.S. more frequently for those who do not know English. An attempt should be made to determine the availability and appropriateness of short courses in Puerto Rico and Mexico.
- 4) Observation training should be arranged for key Salvadorans in this program to see firsthand the fruit and vegetable producing areas of California.

ISSUE #4: Determine what progress has been made in improving the institutional capacity of the public sector to transfer technology related to irrigated agriculture to farmers; determine to what degree the training of farmers has taken place; determine whether training events are properly focused and have been effectively implemented; and determine whether farmers are receiving sufficient exposure to the technological components of irrigated agriculture. In order to carry out these duties, employee will need to review the results of a sample survey of farmers who have participated in training activities and verify the adequacy of the information contained in the survey. Employee will also need to collect other needed information in order to complete this part of the SOW.

a) Discussion

Farmer training in irrigation has been accomplished principally on demonstration areas ranging from 0.5 to 2.0 Mzs. Twenty-four such plots were being used in 1989, for a total area of 28 Mzs. The project sponsors one-day demonstration sessions for groups of farmers. Such sessions are generally conducted once each week, and address one or a few special topics.

A survey of farmer opinions by the extension service, in connection with their training courses using unidentified farmer questionnaires, indicates that the training and field demonstrations are of good quality, that useful concepts are presented, and that the Project activities in irrigated agriculture have increased the area irrigated on cooperatives and other small farms. A summary of the changes in production, employment, and income resulting from these courses and demonstration field days is presented in another portion of this evaluation.

A large percentage of those questioned indicated a desire for more training in irrigation, pest and disease control, and vegetable production per se. The four most popular vegetables are tomatoes, chili peppers, melons, and cucumbers. The most popular fruits are oranges, papaya, and mango, in that order.

Demonstrations visited by the team were furrow irrigated. Usually the irrigation schedule was fixed rotation. Farmers had been instructed in the required application time. Water was not measured, nor the amount of application estimated.

The survey of farmers' opinions did not evaluate the possible use of radio, printed instructions, or other similar training materials. Most farmers have little education. However, frequently individuals who can read and explain are available. Sometimes children obtain more education than their parents and can assist in training.

Overall, we would have liked to see a more systematic approach to the information transfer/farmer education process. Though many farmers have gone to one or more of the training sessions, according to the extension agents, most have not been consistent in their participation. Since farmers who go to these sessions are from widely disbursed farming sites, the follow-up is on an individual basis. This makes for rather expensive transfer costs. Had there been groups of farmers from the same geographic areas involved (e.g., from not more than 2-3 Kms. apart), the training could have been tailored more specifically to their needs, and sessions could have been carried out with the same farmers every two weeks during the production period.

b) Conclusions

- 1) Farmer demonstration is carried out on demonstration plots, to which the farmers are invited for field days.
- 2) The farmer survey indicates that most farmers feel the training and demonstrations are of good quality and the concepts they impart are good.
- 3) A large percentage of farmers surveyed felt that they

computers, 5 vehicles, some laboratory equipment for soil physics, a copier, agricultural equipment, and audiovisual and teaching assistance. Two of their professionals are now in Mexico for training at the M.Sc. level (1 in agricultural extension and 1 in plant protection).

ENA's future may be brighter. Congress is considering a new law (Ley General de Educacion) which would give ENA legal status for conferring degrees at the B.Sc. level. ENA's director is optimistic about its approval. There has also been consideration given to a loan from BID (IDB) to be administered by FEPADE. A 10-year grace period and 40-year repayment period with 1 percent interest has been mentioned. It is anticipated that, if approved, ENA would then be financed as a private school, probably with university status.

b) Conclusions

- 1) ENA's training program is progressing well; however, the lack of some types of irrigation equipment will not allow the students to gain full experience in using different systems.
- 2) As technology in non-traditional irrigated crop production increases in El Salvador, higher level training will be needed by both the staff and students of ENA.

c) Recommendations

- 1) Efforts should be intensified to train several more participants at the M.Sc. level, in order to improve the faculty's technical capacity.
- 2) Short term professional assistance should be provided for:
 - (a) Upgrading the ENA library with books, periodicals, and bulletins related to the problems and potentials of irrigated agriculture.
 - (b) A competent high-level team of short term agricultural educators, experienced in irrigation and vegetable production, to review the curriculum in irrigated agriculture to improve its effectiveness and the technical expertise of ENA's graduates.
 - (c) Participation in formulating research activities and assisting ENA graduate committees.
 - (d) Review of CENTA and CENCAP activities to determine whether they can be achieved more efficiently by a

private university.

(e) The two very outdated CENTA and ENA libraries should be combined into one that is reasonably modern and adequate for training and research activities.

ISSUE #6: To what extent do administrative, technical, and financial limitations constrain the GOES' commitment to Project implementation? Do these constraints indicate a need to modify the Project design, implementation schedule, or budget?

a) Discussion

The success of this type of project, based on the production of intensively grown, extremely perishable vegetables for fresh market and processing using irrigation, more than almost any other AID project depends on the timely provision of funds and the quality and continuity of services and equipment to the recipient agencies and farmers. Timing soil preparation and crop planting to meet the high price export windows and the operating schedule of national processors is extremely critical. Even a one or two-week delay in planting can reduce the price of the exported product by as much as 50% in the U.S. market. Likewise, if a processing plant in El Salvador cannot secure its raw materials on time, it can incur large debts, seriously jeopardize its reputation, lose good employees to other employment opportunities, and miss the delivery dates of its export contracts with foreign companies.

In order to train personnel, purchase required equipment, get farmers to plant on time, and have a good chance for a successful program in irrigated agriculture for the export market, all documentation pertaining to the administration and management of this project must be made by July of each year.

Our appraisal of this process indicates that it has functioned differently for the private and public sector agencies participating in the program. While the transfer of funds to FUSADES/DIVAGRO occurred on time and permitted them to carry out their work schedule, train farmers, and make loans to farmers and processing plants, it has not been so for the public sector. This seems to be the result of different AID Project management guidelines for the two major entities of this program. It is also the result of an excessively cumbersome GOES approval and operating system for the public sector that is not conducive to promoting the goals of this program.

Originally, the management and coordination of the Project was the responsibility of the Vice Minister of Agriculture. Since this person had many other obligations, he could not devote sufficient

time to the management of the Project. As a result, some of the agencies had inadequate supervision and direction. Coordination among them was not adequate for the job, and the collaboration of public and private sectors under the terms of this program was almost non-existent.

Due to the past problems in coordination, the new Cristiani government, apparently at AID's request, established the Gerencia de Manejo de Aguas (GEMA) in September, 1989. This office was responsible for coordinating all of the public sector agencies participating in this program.

The GEMA has disbursed the public sector funds under the Project through CENTA. Their management of this has left much to be desired. They appear to have focused more on their role, and that of ENA, than on the overall effort of the public sector agencies participating in this effort.

In order to ensure that the required funds are obtained to carry out this program with counterpart funds, for the period from October 1989 to the end of the project, government agencies completed their first comprehensive collaborative action plan in March 1989. This plan was drafted with assistance by the AID Rural Development staff, the program's technical assistance team, and personnel from OSPA, OCOPROY, GEMA, CENTA, ENA, DGRD, OEDA, and CENCAP, beginning in March 1989. The plan was to become operational on October 1, 1989. It required local currency counterpart from P1-480/1987 and P1-480/1988 accounts held by the government.

Once drafted, the work plan then went through seven steps to secure approval of GOES funding:

- (1) Approval by each action agency on the parts that they were expected to carry out, and the personnel and equipment required.
- (2) Approval by OCOPROY.
- (3) Approval by the technical assistance staff of the qualifications of the proposed personnel.
- (4) Approval of the plan and budget by the Office of the Minister of Agriculture.
- (5) Operational approval by SETEFE.
- (6) Financial approval by SETEFE.
- (7) Approval by USAID.

This approval process is not only a result of the actions of the GOES; since USAID has a very pervasive role in approving any program undertaken in this country, it too has a very profound effect on Project approval and operations.

Both during and after the initial Project work plan and budget were designed, a series of meetings between AID, SETEPE, and the Ministry of Planning resulted in numerous changes and rewrites. The design team was asked several times, under different sets of criteria and changing guidelines, to revise the implementation period of the action plan. Changes were also requested for the number of personnel to be financed by the program, equipment lists, construction projections, quantification of goals, and various activities of the original action plan. All of these changes took much time and effort, and contributed to confusion.

USAID, apparently as a result of a review of its own financial situation, availability of funds, and changing strategies for dealing with the government on this program, took considerable time developing its position on this plan. Disagreement over when the GOES was to assume responsibility for payment of extension personnel also extended the negotiations. Likewise, SETEPE insisted on changes and placed additional, apparently cosmetic, conditions on the work plan which added design problems and delays in approval. As a result, SETEPE did not approve this project for counterpart funding until March 14, 1990.

This constantly changing set of guidelines and instructions by both the GOES and AID set back progress of the program this year much more than necessary. It reduced morale of the Project staff, delayed payment of their salaries, and did not permit them to go to the field to assist their farmer clients. This, on top of the problems associated with the revolution in November and December, seriously affected output and attainment of project goals. It also contributed to delays in planting and production during the best months of the export market window in the U.S.

Clear guidelines must be established and consistently adhered to by both USAID and GOES, well before the beginning of development of the annual work plan. The plan must be completed and approved by June at the latest, for the following year from July 1 to June 30. This is essential for training operations at various levels and preparation of the public sector team to work with FUSADES to help farmers and processors carry out their missions.

As noted above, the approval process for the annual work plan has been more of an obstacle than the overall administration of the project or technical considerations. These delays affect the amount of counterpart funds received to date. In fact, the Project's local staff is reportedly now facing another possible delay in the payment of salaries and operating expenses.

In spite of these problems, we have seen remarkable improvement of coordination of Project operations and efforts by the public sector agencies, compared to those that existed during the past evaluation. All concerned deserve recognition for their efforts. We wonder what would have been the results if they had not had these problems?

In order to address the above, the public sector agencies and DIVAGRO must meet on a regular basis to discuss progress and solve problems on a timely basis. In these meetings, they should address issues relating to the approval of the program's annual work plan, identify areas where the two groups can exchange experience, share information, and discuss practical solutions. They must be catalysts in promoting the success of this extremely important program. USAID's role in promoting such coordination is great, and both DIVAGRO and the public sector agencies involved in this program could greatly benefit from such coordination. USAID must stress the importance of keeping to schedules, and planting and harvest deadlines must be understood as the bottom line of AID agricultural assistance.

b) Conclusions

- 1) At the outset of this program, this country had very little interest and experience in irrigated agriculture. Almost all of the production was in traditional crops such as coffee, sugar, and cotton, as well as the basic food crops. Changing this has required training many technicians and farmers in irrigation practices and production of intensively grown crops for the export and local markets.
- 2) This program started very slowly and has only in the past year begun to be in an administrative and technical position to fulfill its role in promoting irrigated agriculture. It is now rather widely accepted by the government, technicians, and farmers that there are real opportunities in irrigated crop production, and that this must be one of the important elements of El Salvador's future rural strategy.
- 3) There is a long-standing separation between agriculture efforts in the private and public sectors which has not been fully overcome. Progress is being made in coordinating combined programs, but USAID, the senior administrators in the government, and various agencies must work more cooperatively for maximum success in the production, harvest, and processing of perishable products for export.
- 4) The production of perishable crops for packing, processing, and export must be initiated in time to meet the

high-priced foreign market windows that run from November to April. This means that the work plans, budgets, and staffing must be approved by July of each year for the next year's operational cycle.

- 5) The major problems in the financing of this program by the GOES have been related to the extremely slow approval of budgets, work plans, staffing decisions, etc. This appears to have been due largely to the extremely cumbersome system for developing work plans, approving of counterpart budgets, and agreeing on the number of staff of the program, as well as coordinating efforts once the program is approved. Nine steps are required of secure approval of contingency funds, causing months of delay in the process.
- 6) This approval process has caused delays in the payment of national staff; lack of gasoline to attend the needs of the Project in the field; and delays in carrying out the training courses for national technicians and farmers, implementing essential research, and funding costs of the demonstration plots being run by the extension staff in the four regions.
- 7) Changes are needed in the operational strategy (see Issue #7) for training farmers and providing technical assistance.
- 8) This program has created a basis for considerable expansion in irrigated agriculture, and greatly expanded employment generation and income from the production of irrigated crops. The interest of farmers and technicians is higher than ever before.
- 9) The maintenance of continuity in both the provision of technical assistance and coordination of operations of this program are essential. Major changes in the advisory personnel appear to be needed, but they must be done in such a way that the forward momentum of the overall program is not lost.

c) Recommendations

- 1) The guidance for the development of annual work plans must be finalized by the first week in April of each year, so that the final plan is ready by the first week in June.
- 2) The problems associated with approval of the annual work plan and budget must be solved by the GOES with the assistance of USAID. We suggest that a study be made of the present approval system to ascertain the steps in the

process and the time and types of decisions made at each step. The results will cause changes to be made in the system to achieve an improved and streamlined system for obtaining approval in order to secure funds in time to carry out the training, technical assistance, etc. needed to meet market windows for export crops.

- 3) Over time, changes should be made in technical assistance. An overall program strategy must be developed to guide all future operations. Time-phased and quantified operational plans are essential for reaching larger numbers of farmers and integrating their efforts with the capacity and operations of export processors and the local markets.
- 4) The public sector approval process by both the GOES and USAID must be improved.

ISSUE #7: Has the technical assistance provided been appropriate and effective? To what extent have the problems experienced by the technical assistance contractor impacted on Project implementation and accomplishment of its purpose?

a) Discussion

The technical assistance team of the contractor, United Schools of America, arrived in the country 2 years after initiation of this program (November 1987 for 4 technicians, and March 1989 for the last person). This late arrival of the advisory staff seriously delayed the training program of both the extension agents and the ENA. Their delay also caused some of the public sector agencies to delay their planning, training activities, and development of analyses of the water use situation of the country. It also contributed to delay of analysis of the existing El Salvador water laws that control the use and/or development of the surface and subterranean sources of water in several areas.

Probably the most important effect of this delay resulted in the lack of progress in ENA's decision to establish a training course for technicians and agriculturists in irrigation and irrigated crop production. This in turn caused delays in the development of the curriculum for the course, training of the ENA staff, and the initiation of this program. Likewise, the delay of the arrival of the technical advisors postponed the training of technicians at the management level in the public sector agencies and training of extension agents. The latter in turn caused long delays in farmer training.

Support of the technical staff by the prime contractor has left much to be desired. Delays in the payment of staff on three occasions since their arrival in El Salvador has had a negative

affect on their morale and performance, as well as that of their support staff.

The contractor has purchased only two of the vehicles programmed to meet the team's needs. This has caused some inconvenience for long term personnel in getting to the field, arriving at training courses on time, and has meant inadequate support for their short term consultants. During several periods, the team has had to rent vehicles to carry out their work plan, increasing transport costs.

Late payment of the short term advisors has caused both the local advisory team and USAID to postpone certain essential consultancies that were scheduled. At one time their office lights, water, and gasoline credit were cut off due to late payment.

Probably the most negative affect of the financial problems has been on the morale of the staff and their families. At times, this has affected the team's concentration on their work. In spite of these financial problems, the team has gone on with the program to the best of their ability and capacity.

Comments by ENA and other agencies of the Ministry of Agriculture have been almost universally positive regarding the technical qualifications and dedication of the advisors. The composition of the team and its technical areas of expertise are as follows:

- (1) Team Leader -- Mr. Wyland Gunderson, Irrigation Specialist
- (2) Farm Level Irrigation Spec. -- Mr. Eugenio Fernandez
- (3) Training Advisor -- Mr. Eduardo Huidobro
- (4) Marketing and Farm Management Advisor -- Mr. Jose Mario Carillio
- (5) Pest Management Advisor -- Mr. Hugo Sosa

The composition of this team has been good for the original activities of the program. This staff has carried out a very heavy schedule of training national technicians at all levels, and provided technical consultation to technicians and farmers, especially at ENA and CENTA. The number of people trained is presented in other sections of this evaluation.

In addition, the team has been extremely active in developing the data bank. They helped identify what equipment was needed, locate it in the participating agencies, and establish the types of data that would be collected. They taught research methods and analysis of variance to researchers and ENA staff and students; reoriented the CENTA research program; prepared six studies for irrigable

products that have potential for the local market; accompanied technicians and farmers to Guatemala to see vegetable production; and collaborated with the staff members of the various agencies on administrative problems.

There are several areas in which the team has not functioned as well as desired. Their late arrival will prevent them from training the total number of extension agents and farmers called for in the original project design. However, in terms of the time that they have been in-country, they have met or surpassed the number of participants in the original schedule on an annual basis.

With the reorganization of the public sector coordination under the new Cristiani government, there is a real opportunity to guide the entire system into more effective areas of work. They have not taken full advantage of this opportunity by joining the Senior Level Coordination Committee, where they could exert considerable influence and direction over the entire program. They have met with the working group on training almost weekly, but this group does not have the overall role or effectiveness of the Senior Coordinating Committee. Similarly, they could have been more instrumental in bringing the public and private sectors of this project to work together, and coordinating efforts that could assist both farmers and processors. Their contract with AID did not call for this type of assistance; it should have been modified accordingly last year.

The team has also not assisted the public sector agencies in developing a good technological transfer extension model that can more efficiently work with and teach large numbers of farmers. Too much time is being spent by extension agents working with individual farmers, so that the full impact in terms of number of farmers assisted on a regular basis remains less than desired. It does not appear that the U.S. extension advisor has spent adequate time with the extension service to correct this problem.

Since the full impact and use of irrigation for the production of crops will not be completed during the present term of the Project, additional technical assistance will be required during the next several years. We suggest that within the next year the advisory team be reorganized both in its technical capacity and its operational mode. In this context, we suggest the following:

1) Coordination Support

With the public and private sectors becoming more deeply involved in this program, there is a serious need for full coordination. The team leader should spend less time teaching, doing routine office work, and supporting both CENTA and ENA. This person should become the senior advisor to the public sector program and the project coordinator on overall administration of the Project, and should

attend and assist the GEMA in policy development, program strategy design, establishment of work plans, and the real evaluation of progress of the different activities in quantitative and operational terms. Without this evaluation system, they will never fully know if the program that they are carrying out is really effective.

In addition, this advisor should maintain good relations with DIVAGRO and FIDEX to support coordination with the public sector. There are many different areas in which, through cooperation between the two groups, they can stimulate both the production of non-traditional crops and their processing. This person can have a very important role in bringing these two groups together and identifying areas in which they complement each other.

2) Team Composition

We suggest changing the composition of the team during or after the next year (when ENA should be able to carry out its training program with reduced foreign support). Progress to date indicates that changes are necessary for the future. Since the program must be more aggressive in promoting production, the team should have at least two horticulturists who specialize in vegetable production working with the extension service. The project is really involved in the production of perishable products using irrigation as well as the development of increased capacity for selling these products in fresh or processed form; it must be technically equipped to attain this objective.

The advisory team is currently composed of experts in several specific areas that affect vegetable production (e.g., pest control, marketing, irrigation) and the design and operation of irrigation systems. There is no one on the team who has full professional qualifications and applied field experience on the total production cycle and system of vegetable production. This is a serious deficiency which must be corrected. In our opinion, it affects the development of sound technical publications on the production of specific crops. It is also causing considerable delay in using the available information from both national and foreign sources; farmers are not receiving the information and guidance required for real success.

3) Irrigation Area Training

The courses for farmers in both the public and private sectors are currently given to any farmer who wants to go to them. This usually results in farmers attending from many different areas of the country. When they complete their training in a given subject, they return to their farms and attempt to apply the practices. When they need help, they usually call on the extension agent. When the farmers are not located close to one another, the cost of

assistance becomes very high and is a poor use of extension expertise.

Most of the courses that have been given are on specific subjects such as insect control, land preparation, irrigation, crop harvesting, etc. They are not given in a series that carries the producer through the entire process of production of a specific vegetable crop or crops.

In the future, it will be more effective if the courses are concentrated in a specific geographic area and involve a number of farmers who are located close to one another near processing plants. This is necessary so that the practices that are taught are relevant to their particular situation, focus on the products that the local processor or buyer wants, and carry the farmer through the entire production cycle in a continuous flow from the preparation of land and beds. These sessions should be held every two weeks throughout the production cycle for each group. This will permit the agent to more effectively and efficiently train the producers and assist them in producing the type and quality of products that are needed by the packer or processor. Visits by the group to the farms of the other students in the course to see activities, successes, and failures will engender peer pressure that will benefit all.

b) Conclusions

- 1) The technical assistance has been appropriate for the initiation of the graduate course at ENA, and their instruction has been rated highly by both the students and faculty. Indeed, many feel that without their assistance, this program would not have materialized.
- 2) The technical assistance and training provided to national technicians has contributed greatly to a better understanding of the need and use of water for irrigation, stimulated a significant amount of awareness of this country's potential, and assisted in much more overall concern for irrigated agriculture at most levels of the public sector. This, however, does not mean that they have reached their full potential.
- 3) The problems of the technical assistance contractor have affected the morale of its long term employees and their families and has had an unmeasurable affect on their output. It has resulted in the delay of the arrival of essential equipment, which affected the progress of the program, and inadequate transportation that has at times caused inconveniences, added cost for rented vehicles, etc. This problem has also caused the team leader to spend an inordinate amount of time following up on the financial aspects of the contract, and has increased the

amount of reporting that he has had to do. This continuing problem has affected his technical output. Its major effect has been to reduce the use of badly needed short term consultants.

- 4) The failure of the prime contractor to visit the program and work closely with its staff has had an additional effect on the staff's morale, performance, and probably its working relations with USAID.
- 5) It is a tribute to the dedication and tenacity of this technical staff that it has continued to work as well as it has in the face of financial and support problems.

c) Recommendations

- 1) A permanent solution must be found to the technical assistance problems experienced to date.
- 2) Changes or additions should be made to the technical assistance staff by hiring at least two vegetable production extensionists to work with the extension staff in the field. Additional adjustments should be considered to make the overall technical assistance more effective and responsive to the needs of the program in the future.
- 3) Several suggested changes regarding the mode of operation and the role of the Chief of Party are made in the discussion and warrant consideration by the GOES and the USAID.

PRIVATE SECTOR COMPONENT

ISSUE #1: Assess the progress of the implemented credit activity administered by FIDEX in terms of Project design and targets. The assessment must include the number, size, and total value of loans; purpose of loans; number of farmers benefiting directly or indirectly; area brought under irrigation through "Model A" and "Model B" projects; foreign exchange generation; and labor generations.

a) Discussion

There has been considerable progress in FIDEX in evaluating and processing loans, monitoring the disbursement of each individual loan, and following the progress of the borrower in implementing their loan program. Since the last evaluation in 1988, when only 4 people were working in this agency, there are now 9 lending specialists. All have had training in loan and financial analysis, computer operation, and credit management. We were informed that whereas it required several months to process a loan in 1988, it now requires about one month to evaluate and approve a loan proposal.

FIDEX has noted problems in the disbursement of loans, due in part to the time that it takes to register the loans with the government, and the procurement of equipment from abroad.

FIDEX depends on DIVAGRO to find clients and help them develop the proposal. There have reportedly been some problems within DIVAGRO in the design of initiatives in new types of ventures, apparently due to a lack of specific expertise in these kinds of enterprises, but they have had good results in the amplification of existing farm or processor activities. FIDEX states that the work of the technicians at DIVAGRO has improved considerably within the last year. Their technical analysis has been especially good.

At the time of the last evaluation, in December 1987, FIDEX had made 5 "Model A" loans for irrigation equipment totally 19,204,084 colones, and 3 "Model B" loans for a total of 26,1287,604 colones for construction or equipping processing plants and, if needed, irrigation equipment for production to partially supply these plants.

As of January 1990, FIDEX had approved a total of 37 loans. Of these, 12 are "Model A" loans for irrigation equipment valued at \$986,683 U.S., and 25 are "Model B" loans valued at \$7,999,000 U.S. One hundred and five farmers are benefiting from these loans and are supplying the processing plants with raw products.

FIDEX also reports that it has an additional six loans being prepared by DIVAGRO or undergoing financial analysis by FIDEX at

this time (March 1990). These new loans will have a total value of 4,100,000 colones. Two are for irrigation equipment ("Model A") and 4 are "Model B" type loans. It is FIDEX's goal to obligate all of the loans by the PACD. This may not happen as planned due to various factors. USAID should monitor this very closely and, if necessary, extend the PACD.

At the beginning of this program, due to the wording of the Project Paper which required the use of "precision irrigation," all the feasibility studies by DIVAGRO concentrated on the development of drip or sprinkler systems. After the first evaluation, an implementation letter was submitted by USAID, permitted the use of furrow irrigation. There is considerably more land available for irrigation using furrow systems (probably more than 150,000 Mzs.) than for the high-cost "precision" types proposed before 1988.

Unfortunately, DIVAGRO has made little effort to promote these cheaper systems to larger numbers of producers. This is unfortunate since more farmers could have benefited from this loan portfolio than have done so, due to the lower initial cost and maintenance of this type of system and its applicability to large areas of this country. Furrow irrigation is the predominant system of irrigation for vegetable production in the U.S. today. Installation and operation usually represents one-half to one-fourth the cost of drip or sprinkler irrigation on a per area basis.

We have been led to believe that USAID staff encouraged more loans for constructing and equipping processing plants than for irrigation per se. This is probably the result of the change in the amount of money that USAID permitted for "Model B" loans under Amendment No. 7, item No. 4. There is no doubt that the new processing and packing plants will serve as "pull" mechanisms for production. We fully support this. However, the number of loans for irrigation, the real purpose of the Project, has been disappointing and has lagged far behind other DIVAGRO and FIDEX activities and the intent of this Project.

DIVAGRO has promoted and assisted potential clients in preparing feasibility studies, and assisted farmers in the installation and use of irrigation equipment and the production and harvest of their crops. They have three demonstration plots with over 40 Mzs. of land. These are used to teach farmers with FIDEX loans, as well as other interested farmers.

DIVAGRO also makes technical assistance contracts with growers who do not have FIDEX loans, to guide their production and assist in solving specific problems. Their technicians are currently under contractual arrangements with 35 farms. The crops that are produced on these farms range from melons to flowers. Demand for this type of assistance appears to be growing rapidly. This has been a good support system for many mid-size and large farms that are too complex to be served by the extension service at this time. This

program should be continued and if possible expanded.

Although the Project got off to a slow start, the results of the FIDEX loans and DIVAGRO technical assistance generally exceed the PP targets for "Model B" type loans. They will not, however, attain the Project goal of 2,500 Ha. of new irrigated land under production. A summary of the progress that has been attained through this program using Project funds is presented in the following table.

FIDEX/DIVAGRO "MODEL A and B" LOANS THROUGH DECEMBER 31, 1989
VALUE AND CONTRIBUTION TO THE ECONOMY
(Source: DIVAGRO)

Type	No. made	Purpose of loan	Total value (US \$) ted	Number farmers benefit- (Mzs.)	Area irri- gated (P/days)	Labor genera- tion (US \$)	Foreign exchange created
A	12	Irrigation Equipment	986,683	12	384	48,286	884,598
B	25	Process. Plants	7,999,000	105	778	579,426	10,615,181
T/A*		Farmer Pro- duction As- sistance	----	121	2377	337,998	6,192,189
Tot:	74		8,985,683	238	3539	965,710	17,691,968

*Technical assistance is provided to both loan recipients and other farmers under DIVAGRO technical service contracts. The values presented here are only for farmers assisted under contract without FIDEX loans.

The program has not, under the loan portfolio, generated the area of new land under irrigation called for by the Project. It was the program goal to irrigate 1000 Mzs. under the "Model A" loans and 1500 Mzs. under the "Model B" program. In part, the failure to obtain area goals has been due to the high cost of the pressure systems of irrigation that were promoted during the first two years, and the lack of a change of operation using more furrow irrigation systems authorized by USAID in early 1988. There are two new loans presently being developed for consideration by FIDEX that would add an additional 160 Mzs. to the total area irrigated.

There is growing interest in further expansion of irrigation in this country, awakened by this original program. Considerable processing capacity exists and additional plants are presently under construction that will require raw products next year. We suggest that part of the funds for the new 0327 Project be earmarked by AID for furrow irrigation exclusively. DIVAGRO and FIDEX have not given adequate attention to this type of system. As a result, not as many farmers have benefited from this element of the Project as could have if it had been promoted more aggressively.

It should be noted that the 0303 loan was made to be disbursed in colones, and the repayment was also to be in colones. The new AID (0327) loan to FIDEX is made in dollars, and the borrower must repay in dollars. We were informed that the interest rate for this loan is to be 22% per annum. With the present devaluation of the colon, it may be very hard to find clients for this loan under these terms. By comparison, we have been told that the LAAD is lending for similar activities under the same conditions as the 0327 loan, but is charging only 12% interest. Under these circumstances, USAID may wish to review the situation and make changes in its loan if warranted.

b) Conclusions

- 1) The funds for loans may not be fully committed before the PACD.
- 2) The funds available for "Model B" loans for the program will be fully spent at the end of the program. The number of loans will be greater than originally designed. These loans are the "pull" for the entire program and are very important to the entire efforts.
- 3) The private sector portion of this Project will probably not require additional funds from AID for technical assistance after the PACD. The new AID Project (0327) will absorb all of the staff of the 0303 Project, and will provide technical assistance.

c) Recommendations

- 1) We recommend that a no-cost loan extension be given to FIDEX to fully approve and disburse the loan fund.
- 2) As it appears that FIDEX may not be able obligate all of the loans by the PACD, we recommend that USAID closely monitor same and, if necessary, extend the PACD.
- 3) Since there is growing interest and capacity in expanding furrow irrigation systems in this country, and more money was spent in the "Model B" loans than expected under 0303, we propose that at least \$2 million in the 0327

project be earmarked for this purpose.

ISSUE #2: Assess DIVAGRO's technical assistance activities in non-traditional irrigated agricultural production for export within the Project's context. Employee will consider the purpose for which technical assistance was provided and measure its impact in terms of number of farmers benefited either directly or indirectly, the area brought under irrigation as a result, foreign exchange generations attributable to this activity, and labor generated.

a) Discussion

Since the beginning of this program, DIVAGRO has provided technical assistance in irrigation system design, irrigation system management, production, harvesting, and training to farmers and processors with FIDEX loans. In addition, they have made technical assistance contracts with non-loan farmers and processors to help with various aspects of production and processing a range of crops and marine products. This activity started slowly but has gained momentum in the last several years.

DIVAGRO currently has 74 different contracts for technical assistance. They work with the producer or processor to determine needs, type, and extent of assistance that is required, and assign one or more of their specialized technical staff to collaborate with the client, usually on a weekly basis. Their staff goes to the farmer's field to review progress and operations. Similarly, they assist processors in almost any aspect of their business that is required. In addition, the DIVAGRO office in Miami, Florida will follow-up on the products that their clients ship to the fresh product market to see that the shipment arrives in good condition, is accepted by brokers, meets the competition's pack and quality standards, and gets a proper price when sold. The Miami office reports back to DIVAGRO changes in the market preference for products that El Salvador produces, and identifies other outlets for national exporters.

This program is well within the terms and objectives of this Project and has generally been considered a success. The demand for services is growing constantly. DIVAGRO's expertise has, however, been criticized occasionally for not being fully up to date on the technical changes that are occurring in some specialized fields. This is natural when a relatively small staff is charged with supervising a broad range of commodities in vegetable and flower production. Overall, this evaluation team believes that they have done a good job and should continue. When they become involved in a really new production program, they should call on short term specialists to assist them. There is no substitute for experience.

At the present time, DIVAGRO has 2,377 Mzs. under technical

assistance contracts, and an additional 1,162 Hzs. supported with technical assistance under loan agreements. On these farms, they have promoted the production of cantaloupe, honeydews, hot peppers, asparagus, tomatoes, vinya beans, cauliflower, cabbage, onions, and a range of flowers and foliage plants. The estimated amount of labor and foreign exchange generated by these enterprises is presented in the table above.

DIVAGRO also has three demonstration farms, at different elevations, on which they are growing a range of vegetables. The early work (1986-88) was carried out with the cooperation of technicians from the Chile Foundation, who performed a series of trials of different types and varieties of vegetables which a previous study had determined could enjoy a good market in the U.S.

Since the Chile Foundation technicians departed, the national technicians working in DIVAGRO have continued this work. They evaluate different varieties of vegetables and select the best yeilders with the quality desired in the fresh or processed product export market. The results serve as the basis of their recommendations to producers.

The DIVAGRO demonstration farms are also the center of training activities in the field; three students from national universities are conducting their thesis research on these farms at the present time. This sort of assistance to students should be expanded as much as possible to involve more graduates of this country in irrigated agriculture.

b) Conclusions

- 1) DIVAGRO has an active technical assistance program for both farmers and food processors that receive loans from this program, and non-loan producers.
- 2) Their technical assistance program is well within the Project's objectives, has served a very valuable service, and should be continued.
- 3) The three demonstration farms are assisting DIVAGRO's staff in learning the best varieties and species to be grown in this country, and permits determination of the costs and profits of "commercial" production.
- 4) More of the area on their demonstration farms is irrigated with pressure equipment than by furrow. As pressure irrigation is considerably more expensive than furrow irrigation, the competitive position of some farmers would be reduced when the export price is low. Consideration should be given to increasing resources for furrow irrigation demonstration and training.

- 5) The demonstration farms are very well used for training farmers and students. Courses and field days are held every week. An estimated 800 people attended these sessions last year, and interest is growing steadily.
- 6) There has been some criticism of their technical assistance program by a few farmers. This appears to be due to the fact that they are assisting a wide range of production enterprises. Their small staff does not have adequate expertise in some of these areas. In highly specialized production and/or processing situations, they should use short term consultants for support.

c) Recommendations

- 1) The technical assistance contract program to assist farmers should be continued and expanded as much as possible.
- 2) On these demonstration farms, DIVAGRO should use more furrow irrigation to show farmers how this type of irrigation system can be properly used, and a greater diversity of crops should be demonstrated.
- 3) More use should be made of outside consultants, on a short term basis, in assisting fine points of production and processing.
- 4) DIVAGRO should have someone on their staff who has real experience in wholesale marketing of perishable crops in the international market.

ISSUE #3: Given the accomplishments to date, the level of expertise at FUSADES/DIVAGRO, their degree of operational maturity and foreseeable conditions, what are the prospects for achieving the targets for this component by the end of the Project?

a) Discussion

Considerable progress has been made by both the public and private sectors in changing the attitude of farmers toward their real production potential using irrigation in the production of high-value crops for the national and export markets. This has not been an easy job. DIVAGRO has had to train its staff and the technical agents for the processing plants, stimulate the equipment distributors to expand their operations, and encourage individuals to construct and operate processing plants.

This has been no simple accomplishment, since it has also been done during a period of major political unrest in the rural sector. Both the civil disturbance and the uncertainty of land ownership has affected the project. Luring farmers from traditional crops that

have rather sure markets and prices, to higher risk enterprises, is not easy. Nevertheless, farmers and investors are increasingly beginning to see the results of the work done to date, and are becoming involved either as producers or processors.

In this effort, the private sector agency has been very effective and will meet its training goals under the project. It has the best-trained staff in the country for this purpose, and uses them well. This evaluation team is confident that they will meet the targets established by the program.

This does not mean that they will still attain this country's full technical potential for promoting the use of water for irrigation, nor fulfill the desire of larger numbers of farmers to go into the intensive production business. Less than five percent of the land that can be brought into high levels of production is presently used for this purpose, and the processing capacity is still very small.

From the DIVAGRO standpoint, in order to attain this country's full potential in irrigated production of crops for the national and export markets they must continue to grow and increase their technical expertise -- both in the number of technicians, and in their technical diversity. This will become a major problem in the future, when the rural sector gains confidence after the end of the present hostilities. At that time, there will be a major growth and demand for DIVAGRO's services and technical capacity.

In order to be ready to serve this greatly expanded clientele, DIVAGRO will have to train some of its staff in commercial vegetable production and ornamental horticulture, at least at the Master's level; further train its personnel in irrigation system design and water use related to the crops that it will produce; develop improved systems for the quality control of the water used for irrigation; secure additional staff with at least Master's degrees in food technology; and further train personnel in marketing produce, flowers, and processed products in foreign markets.

With peace and some further success in irrigated agriculture, we feel that DIVAGRO will be hard-pressed to meet the demands of all the people who will want its services. It is time to reevaluate its services and capacity to meet the needs of the future. Changes will be needed throughout the institution.

DIVAGRO's training program for farmers has been very aggressive and many farmers attend these courses. The number of courses given has grown annually. In 1990, they expect to give over 30 courses to over 400 producers or processors. This is a very heavy and diverse training plan, and will tax their staff. Some additional thought should be given to focusing training efforts in the most profitable crops and production systems, as well as the business of farming

intensive crops. They do not have the trained personnel for these subjects.

b) Conclusions

- 1) DIVAGRO will not meet the Project targets as laid out in the Log frame.
- 2) At this time, the country uses less than five percent of its capacity for irrigated production.
- 3) It is expected that with peace in this country and increased rural confidence in investing in the rural sector, there will be a major expansion of production of perishable crops using irrigation, as well as a need for many more packing and processing plants.
- 4) DIVAGRO's expertise in the commercial production of vegetables and flowers is still not adequate. Additional staff, trained at a higher technical level, will be needed in several technical areas.

c) Recommendations

- 1) Conduct a study of the real potential for irrigated production, the future needs during the next ten years for processing facilities, and the technical staff requirements of DIVAGRO.
- 2) Plan training programs for DIVAGRO's staff to fulfill these new requirements at the Master's or Doctorate level.

ISSUE #4: What cost-effective alternatives to FUSADES exist to carry out the functions of promotion of non-traditional irrigated agricultural production for export? What are their comparative advantages and disadvantages?

a) Discussion

There are several possible models for carrying out FUSADES/DIVAGRO's functions in supporting non-traditional agricultural development in this country:

- 1) The processing plants and packers assume responsibility for technological and credit assistance to farmers who supply raw materials to their plant.

The advantage of this system is that processors could select their growers with greater care and provide the credit and technical assistance that is needed to meet the demands of their plant. Their technical staff would work closely with

their farmers, help them solve their production problems, and seek outside assistance for the solution of problems requiring specific skills or expertise. Likewise, they could provide the financing needed to produce the crop and/or the inputs purchased at volume prices. This would require the processor to have access to large amounts of funds, and a flexible and reliable administration with good access to outside technical expertise and a solid reputation for honesty and reliability.

Its disadvantages are that producers would be required to sell their products to processors at the price that they want. If the processor is not honest and pays less than the product warrants, this system can cause producers to lose money and they will sell their products under the table to other processors. They will also lose the respect of their growers, receive poor quality products, and lose business.

We know of only one company in Central America that has made a success of this model. They guarantee the producer a minimum price for their production, and underwrite their loans to commercial banks. When needed, they call on specialists from U.S. institutions to solve particular problems faced by their growers. There are very few people in this country with the knowledge and financing to undertake this model at the present time.

- 2) Private consulting companies could be formed to provide technical assistance to producers and processors.

The advantage of this type of service could be competition. Costs to the growers could be less for the technical assistance provided. Since these companies do not or should not be involved in the sale of inputs or equipment, they can also be more objective in their recommendations. This system would open up opportunities for a large number of national technicians with skills in various areas.

The principal disadvantage of this system at this time is that there is neither the volume of business for many private consulting companies to be successful, nor the number of really qualified technicians in this country to meet the needs of this special group of producers. As the volume of production of non-traditional crops grows, this alternative will almost spontaneously begin to seem a viable alternative.

- 3) CENTA could provide some of the expertise that would be required in non-traditional agriculture.

CENTA has some of the technical skills in their staff that could be redirected toward this area. In addition, they have a soils and pest identification/control laboratory that can assist farmers in non-traditional crop production.

The big disadvantage of the CENTA staff at the present time is their lack of high-quality technical personnel, similar to those at DIVAGRO, to support farmers. CENTA has a high turnover rate due in part to low salaries. They have little proven expertise in processing and packing, and the services of their soils laboratory are reportedly not adequate for timely processing of samples required in very fast-growing crops.

We see no other viable alternative to the work of FUSADES/DIVAGRO at this time. They have the best staff in this area of the country to serve both farmers and processors. They are deficient in their technical capacity (detailed in the issue above) and they are not using all of the necessary outside technical expertise that we would like to see; however, until the political situation improves and there are more real successes in this business, the volume of trade will grow slowly. As the political situation improves, others will enter the business and begin to provide alternatives.

b) Conclusions

- 1) Three alternatives to FUSADES/DIVAGRO assistance were examined, but none appear to be viable at this time.
- 2) After national calm and confidence in the rural sector are restored, other alternatives will evolve to give FUSADES/DIVAGRO competition.

c) Recommendations

- 1) As there appears to be no viable alternative to FUSADES/DIVAGRO at this time, we recommend continuing support of their promotion of non-traditional irrigated agriculture.
- 2) As non-traditional irrigated crop production increases, and as the political situation improves confidence in rural investment, independent private sector companies will emerge to provide technical assistance to producers and processors.

ISSUE #5: Assess the effectiveness of FUSADES training activities in the area of non-traditional irrigated agriculture exports. The assessment must take into account the number of farmers trained, the appropriateness and quality of training, and its relationship to the activities of the GOES and other private sector entities (e.g., ENA and FKPADE) in this area.

a) Discussion

DIVAGRO, the agricultural development division of FUSADES, operates three demonstration areas (2 of 15 Mz. each, and 1 of 20 Mzs.). There are also 2 farmer-operated demonstration areas (1 of 20 Mz. and the other of 30 Mz.). Irrigation of the three DIVAGRO demonstrations is from hand-dug wells. The farmer operated demonstrations are irrigated from rivers. Hand-dug wells in the Zapotitan, Chalchuapa, and Comalapa areas have produced safe yields of from 100 to 500 gpm (enough water to irrigate from 10 to 50 Mzs.).

DIVAGRO has used these demonstration areas to teach irrigation and farming practices. Weekly field inspection or production demonstrations have frequently been organized during the cropping season. Sometimes one-week courses are held. At Comalapa, some training was provided for a group of 75 National University students. A list of courses showing type of courses presented in 1989 is displayed below:

Year	Activity	Approx. Participant Days of Class
1987	Irrigation	1700
1988	Irrigation	130
1988	Crop Practices*	550
1989	Irrigation	120
1989	Crop Practices	1370

	Total Student Days as of 1989:	2870

*NOTE: Crop practices includes some irrigation training.

DIVAGRO has on-going trials with several irrigated crops that are used in their training courses and in the printed material that is distributed to students. Some of the courses include discussions of the production and harvesting of the following crops (in approximate order of economic importance at this time): Melons, cucumbers, tomatoes, baby corn, cabbage, onions, bell peppers, carrots, string beans, broccoli, and black-eye peas.

Considerable use has been made of tensiometers, moisture meters, pH meters, and laboratory tests for pH and fertility during the courses, so that the farmer will understand their use in precision irrigation.

There has been considerable effort to comply with the number of students planned in the Project description to receive training, as well as the number of courses presented. Frequently, quality is

more important than numbers.

The success of future Project activities will depend to an important degree upon the adequacy of technical assistance and training of growers in matters related to soil preparation; variety as it relates to the market to be served (e.g., fresh or processed); planting distances as they relate to the system of irrigation used; water management; improved and safe pest control following EPA regulations; and the proper harvesting and grading of the crop.

An internal review of DIVAGRO's progress in their training program is suggested. This should take into consideration the training program of the public sector. Both of these efforts must not be duplicative, but rather complement each other as much as possible.

b) Conclusions

- 1) Our review of training activities led us to conclude that they are presenting the best training in this country at this time. Their courses are fairly well designed, usually presented at the appropriate time, and cover the required range of topics.

c) Recommendations

- 1) Bulletins, leaflets, books, and information on yields, labor requirements, and cultural practices are available from many sources including universities, extension services, schools, and research organizations. DIVAGRO must make a greater effort to secure these as references for their training program.

Publications on the most modern production practices should be obtained from California, Florida, Escuela Agricola Panamericana, and Guatemala. FUSADES should provide translations and modifications to produce practical descriptions of cropping practices for each of the important non-traditional crops and for irrigated coffee. These materials should be made available to all agencies working in aspects related to the production of the crops considered.

- 2) The International Vegetable Center in Taiwan, as well as other institutions, has a range of vegetable specialties that should be tested in this country.
- 3) FUSADES should contract with an engineer with practical experience in surface irrigation (gravity) design, operation, and scheduling, to provide greater emphasis

on this method in the training program.

- 4) Promotion of non-traditional crops is recommended for the new areas under consideration by DGRD for eventual construction of large gravity irrigation projects. A start should be made as soon as possible by encouraging some pump irrigation in the project areas prior to project construction.
- 5) Increased use of the Executive Service and VOCA as sources of short term specialized consultants is recommended for training courses. Retired Spanish-speaking farmers and specialists from the extension service can provide much assistance in improving the practices recommended for each crop.
- 6) DIVAGRO now receives market information relative to demand and prices. Results such as labor requirements, market information, and income generation from demonstration areas need to be incorporated into the Project's data bank and included in the farmer training program.
- 7) DIVAGRO appears to be presenting the best courses in non-traditional crops being given by Salvadoran technicians at this time.

ISSUE #6: What have been the results and impact of the field agent program in terms of contributing to the promotion of non-traditional irrigated agriculture production for export?

a) Discussion

The DIVAGRO progress report for the period March-September 1989 indicates that 39 private sector field agents were trained, out of a project goal of 60. The report indicates that 3,539 Hx. "have been developed for the production of non-traditional irrigated export crops." Due to previous training of agents, there are now 41 total agents. Only one is employed by an input supplier, which was thought to be the major user of this type of support. Most of the national input suppliers are not interested in hiring more technical workers, due to the low volume of sales of irrigated equipment at this time.

In the last 6-month reporting period, July-December 1989, 396 farmers received training in 11 seminars on production of non-traditional export crops under irrigation. Some of this training was transferred to the producers through the field agents who were employed by the packers and processors. The value of non-traditional exports from project activities as of October 31, 1989, was given as \$2,570,295. The labor created on FUSADES projects is

reported as 215,442 person/days. This figure has increased dramatically in spite of the major setback caused by the political problem in November and December of 1989.

The field agent program has made a valuable contribution in promoting non-traditional agriculture. However, some failures have been noted and every possible effort needs to be made to improve the competence of these agents so they can provide better assistance in production and marketing to growers. Forty-one technical agents are currently employed by processing plants to assist farmer suppliers. DIVAGRO has tried to further this type of support but has not had the level of interest desired by equipment suppliers. Only one supplier has hired an additional agent, in spite of the fact that DIVAGRO will pay one-half of the salary of these companies' employed technicians for the first two years. The equipment suppliers were originally envisioned by the Project as the main users of this element of the program.

The company agents employed by packers and processors have been very effective and have worked with the farmers very well. They assist farmers who are growing crops under processor contracts to ensure that they are using the best methods of production and are harvesting their crop in a manner that will assure that it arrives at the plant in the best condition possible.

b) Conclusions

- 1) The field agent program has progressed well in spite of the fact that the equipment suppliers, who were expected to be the major users of this element of the program, have not used it.
- 2) There are 41 field agents now working in the processing companies, assisted financially by the program. They are carrying out a very valuable service in support of the farmers who produce for the packing and processing plants in this country.
- 3) The agents coordinate their work with DIVAGRO technicians very well, and reportedly relate to the producers well.

c) Recommendations

- 1) Increased use of short term technical assistance is recommended in technical areas where there is not sufficient expertise in this country, so that the research and extension support to farmers builds on the experience of other countries.
- 2) Observation of field practices during the crop season in Florida and California is suggested.

- 3) This element is extending the service that DIVAGRO can carry out at less cost than adding more direct-hire people to DIVAGRO. It should be continued if at all possible, but DIVAGRO should not fund these technicians for more than two years as it now does. -

SECTION FOUR: LESSONS LEARNED

1. The Project's concepts are sound. There appears to be no viable alternative approach to significantly increase the demands for rural labor, and to promote increased non-traditional export. It is evident that the designers of the program did not properly assess the time and effort that would be needed to take farmers with no experience in intensive agriculture to full effectiveness in this type of production.
2. It is necessary to have very clear lines of authority and coordination between the public and private sectors before projects of this type are started.
3. It is not adequate to assign a high-level public administrator responsibility for such a complex program; this person's other responsibilities are too great to fulfill the needs of such a program.
4. There are clear links between the public and private sectors that must be used as catalysts for the success of programs involving production and processing/packing for export. Mutual confidence and the will to collaborate are essential for both parties.
5. A broader technological approach with more emphasis on the importance of integrating factors of production and water use would have strengthened the overall Project.
6. The institutional capacity in El Salvador for carrying out the proposed activities and for implementing the reforms necessary for achieving the objectives was, and still is, weak. More emphasis should have been placed in the Project's design on improving inter-institutional coordination in both the public and private sectors. Establishing strong development strategies in support of clear program policies might have significantly improved overall progress.
7. Technology transfer is a slow process requiring access to the best available world-wide knowledge of production and marketing. Testing under local situations and promotion of good technical packages is paramount for success. The extension technicians must have in-depth experience in production and meeting market demand for each commodity produced. Access to technologies developed in similar areas can speed technology transfer.
8. The technology of efficient surface irrigation is complex and requires considerable time, repetition of the basics, and patience on the part of extension agents to train both technicians and, through them, producers at the farm level.

Annex I

LIST OF PEOPLE CONTACTED

Ministry of Agriculture 1. Dr. Jaime Mauricio Salazar	Vice Ministro de Agricultura
OCOPROY 1. Silvia Campos de Machuca	Tecnico
O.S.P.A. 1. Lic. Vilma de Calder 2. Sr. Francisco Enrique Aguilar	Coord. Componente de Planification Jefe, Banco de Datos
G.B.M.A. 1. Lic. Agr. Narciso Matamoros 2. Ing. Carlos Puente 3. Lic. Humberto Gallardo Sosa	Coord. Proj. Manejo de Aguas Tecnico Gerente Administrativo
O.E.D.A. 1. Ing. Roberto Ochoa 2. Arq. Emelia de Quintanilla 3. Dr. Tulio Sandoval	Jefe, OEDA Coord. Tecnica Proyecto Manejo de Aguas Consultor de Corto Plaza
D.G.R.D. 1. Ing. Gonzalo E. Martinez M. 2. Ing. Alirio E. Mendoza 3. Ing. Oscar Menendez Minervini 4. Ing. Rene Gonzalo Menendez Moreno	Director General de Riego Jefe Depto. de Estudios Tecnico en Riego, Tecnico
CENTA 1. Ing. Jose Rene Alvarado L.	Tecnico, Prog. de Riego
CENCAP 1. Ing. Gilberto Orellan 2. Lic. Leonidas Aparicio Giron 3. Ing. Danielo Ernesto Belloso	Coord. de Riego Director Sub Dir.

ENA

- | | |
|---|----------------------|
| 1. Ing. Vilma Elizabeth Cruz de
Martinez | Coord. de Capatacion |
| 2. Ing. Jose Napoleon Bonilla | Director |
| 3. Ing. Carlos Cruz | Sub Director |
| 4. Ing. Luis Coronado Rodriguez | Profesor |

SERVICIO DE EXTENSION - Ministerio de Agricultura

- | | |
|---------------------------------|--------------------------------------|
| 1. Ing. J. R. Cueller Garcia | Jefe de Riego, Reg. IV |
| 2. Ing. Jose Ricardo Rosales | Jefe de Riego, Reg. III |
| 3. Ing. Boanerges de J. Castro | Jefe de Riego, Reg. II |
| 4. Ing. Oscar Oswaldo Ruiz | Jefe, Seccion Experim.
Ahuachapan |
| 5. Ing. Rolando Cazali | Jefe, Santa Ana |
| 6. Ing. Alejandro Escobar | Coordinador Regional |
| 7. Ing. Carlos Salvados Estrada | Gerente Regional |
| 8. Ing. Guillermo Rivas Merino | Dept. de Planif. |
| 9. Ing. Francisco Manuel | Jefe Depart - Sonsonate |
| 10. Ing. Gonzales Vega | |

FUSADES

- | | |
|--------------------------|---------------|
| 1. Sr. Miguel Gasteasoro | Administrador |
|--------------------------|---------------|

DIVAGRO

- | | |
|------------------------------------|--|
| 1. Ing. Mario Molina | Director General |
| 2. Ing. Luis Carlos Palomo | Tecnico en Riego |
| 3. Ing. Mauricio Aguilera | Jefe de Riego |
| 4. Dr. Emilio Saudi | Jefe Sec. de Agro-industria |
| 5. Lic. Ricardo Suarez | Tecnico de Flores y Ornamen. |
| 6. Ing. Manuel Bruyeros | Tecnico en Nuevos Cultivos |
| 7. Ing. Roberto Arbiz | Tecnico en Cucurbitaceas |
| 8. Ing. Romeo Escobar | " " " |
| 9. Sr. Jose Daniel Rivas | Jefe de Banco de Datos |
| 10. Lic. Jenaro Martinez | Jefe de Administracion |
| 11. Ing. Augustin Martinez | Perente de Proyectos |
| 12. Mr. Roberto Richardson | Asesor en produccion |
| 13. Ing. Luis Edgar Heymans | Jefe de Transformacion |
| 14. Ing. Manuel Rodriguez Cedillos | Tecnico de Tecn. |
| 15. Ing. Napoleon Casamalhuapa | Encargado, Parcela Demo. |
| 16. Ing. Nelson Olaf Gonzales | Consultor, Capacitacion Fca.
El Cauco |
| 17. Mr. Roberto Richardson | La Providencia
Advisor, AGRIDEC |
| 18. Ing. Mauricio Guerro | Tecnico en Produccion,
Parcelade Demonstracion,
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FIDEX

- | | |
|---------------------------------|--------------------|
| 1. Lic. Rafael Alvarez Saldivar | Director General |
| 2. Lic. Jorge Monterosa | Gerente Finenciero |

Banco Salvadoreño

1. Jose Ernesto Soto Gomez

Oficial

Agricultores y Procesadores

1. Sr. Manuel Vicente Menjivar
2. Sr. Erasmo Valente
3. Sr. Manuel Guerra
4. Sr. Juan Moreno
5. Sr. Rony Monroy
6. Sr. Pedro Urquilla
7. Sr. Rafael Velarde
8. Sr. Benito Perez
9. Sr. Daniel Soliz
10. Sr. Jose Humberto Garcia
11. Sr. Felix Ramos
12. Sr. Rogelio Henriquez
13. Sr. Claudio Martinez

Presidente, Finca
Xochicali (Flores)
Gerente, Coop. S. Cayetano
Agricultor
Pres., Coop. San Cayetano
Administrador Proj.
"Cerro de Flores"
Presidente, "del Tropico"
Socio, "MelonPac"
Agricultor
Agricultor, Hacienda Santa
Mirabayo
Agricultor, Parcela Monro
Grande
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Agricultor de Parcela
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1. Ing. Wiland Gundersen
2. Ing. Eduardo Huidobro
3. Ing. Eugenio Fernandez
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Team Leader, Water Manage-
ment Advisory Team
Extension Training Adv.
Water Systems Design
Pest Control Adv.

USAID

1. Mr. Henry Bassford
2. Mr. William Ellis
3. Mr. Clem Weber
4. Ing. Rodolfo Crystales
5. Ing. Antonio Gonzales
6. Mr. Donald Herrington

Mission Director
Rural Development Officer
Deputy RDO
Water Mngt. (Pub. Sector)
Water Mngt. (Priv. Sector)
Water Mngt. Proj./Private
Sector

ANNEX 2.

PUBLIC SECTOR PROPOSED TRAINING PROGRAM
(in-country)

FIRST QUARTER 1990
RESEARCHERS, TECHNICIANS, AND EXTENSION AGENTS TRAINING

1. Practical Training for Extension Agents

A. Irrigation: On farm gravity irrigation systems design.

- 1) Region I: 08-March - training by DGRD at Morro Grande.
- 2) Region I: 08-March San Cayetano - training by DGRD.
- 3) Region I: 27-Feb. Chacalcoyo - training by DGRD.
- 4) Region III: 27-Feb. in Ilobasco - training by E. Fernandez.
- 5) Region III: 01-March in Barrio Nuevo - training by DGRD.

B. Soil Preparation for surface irrigation and surface irrigation design and operation. (ENA)

- 1) Region II: 06-March in ENA - training by E. Fernandez.
- 2) Region III: 07-March in ENA - training by E. Fernandez.
- 3) Region IV: 19-March at ENA - training by E. Fernandez.

C. Crop Management.

- 1) Region II: 28-Feb. At Chalatenango agency. Training by Tobar Palomo (CENTA) and Arturo Quintanilla (R-II) agents.
- 2) Region II: 06-March at ENA. Training by E. Fernandez, Hugo Sosa and fifth grade students of irrigated Agriculture Program (ENA).
- 3) Region II: 20-Feb. at Nueva Concepcion - Training by Hugo Sosa.

- 4) Region I: 01-March in Morro Grande - Training by Hugo Sosa.
- 5) Region II: 06-March at ENA - Training by Hugo Sosa.
- 6) Region III: 07-March at ENA - Training by Hugo Sosa.
- 7) Region IV: 19-March at ENA - Training by Hugo Sosa.
Participants No. extension agents.

Pending: Pest Management. Equipment operation for pesticide application. Harvest and postharvest management and marketing.

D. Courses to be to be programmed: Proper Pest Control.
Calibration of spray equipment.

E. Technician Training.

- 1) Irrigation Systems Design and development of projects at the farm level. 34 participants - private bank credit agents - March 5-9, 1990.
- 2) Trip to Guatemala. Participants to come from CENTA, CENCAP, DGRD, Regional extension agents and farmers. March 12-16, 1990.
- 3) Seminar on the accomplishments and perspectives of the Project. Approximately 100 participants. March 22, 1990
- 4) Policy Seminar on Irrigated Agriculture for approximately 40 participants. March 19, 1990.

ANNEX 3.

PROGRAMACION Y PROYECCION DE CURSOS DE CAPACITACION 1990
(PROYECTO 519-0303 "MANEJO DE AGUAS")

PROYECTO PART.	LUGAR	FECHA	
5. Aplicacion de Computadora en diseno de sistemas de riego	Universidad Nuevo Mexico, Las Cruces EE.UU.	May 15 June 4/90	3
6. Diseno y Eval.de Riego en la Finca	Utah State Univ. EE.UU.	May 6 June 16/90	10
7. Gira de Estudio s/Produccion y Mercadeo de Cultivos de Exportacion.	Estado de Florida EE.UU.	Mayo 21 Junio 2/90	11
8. Formacion de Instructores	Turrialba, C.Rica	Mayo 29 al 1o. Junio/90	
9. Evaluac. e Implementacion de Politicas, Programas y Proyectos.	Univers./Pittsburgh EE.UU.	Jun 25 al 17 Ag./90	13
10. Manejo de Pesticidas y Post-Cosecha de cultivos	Estado de Florida EE.UU.	Jun. 5-14/90	11
11. Computacion aplicada a la formacion uso e interpretacion de un banco de datos sobre el sector agricola	Miami, EE.UU.	Jun.18-29/90	12
12. Administracion y Evaluac. de Proyectos	Turrialba, C. Rica	Junio 4-22/90	
13. Analisis de Suelos y Tejidos Vegetales y Aspectos de Evaluacion de Fertilidad de Suelos	Turrialba, C.Rica	Jul.9-13/90	
14. Direccion y Admon.de Fincas de Agricultura bajo Riego	Estado de Florida EE.UU.	Jul.2-8/90	12
15. Diseno y Operacion de pequenos Sistemas de Riego	Univ. Nuevo Mexico Las Cruces, EE.UU.	Julio 9 Agosto 5/90	11

ANNEX 4

ENA
Description of facilities and Infrastructure

A R E A	D E S C R I P T I O N
1. Dormitories	Capacity for 500 students in 8 bldgs.
2. Sanitary Services	Adequate capacity as recommended
3. Dining Room	Enough space in one building
4. Kitchen	Enough space and ventilation. Deficient
5. Theoretical classrms	Capacity for 300 students in 9 bldgs.
6. Laboratories	Enough capacity: 4 Labs w/capacity for 42 student.
7. Admin offices	Enough space in three blds.
8. Laundry equipment	Enough building space. Equipment need of repair.
9. Vehicles maintenance Workshop	Enough building space
10. Wood Processing Workshop	Enough building space
11. Workshop for Ag Equipment	Inadequate space for the installation of class/rooms/workshop
12. Agro-business	Adequate building and equipment for teaching agro-business course
13. Library	Adequate facilities
14 Clinic	Adequate building and equipment
15. Training fields	Enough area for the development of crop plant
16. Sport fields	Adequate space and facilities Lack of swimming pool maintenance
17. Gardens	Gardening plans non existence

ANNEX 5

ENA'S PROFESSIONAL STAFF

Professional and Non-traditional Staff
(July 31, 1989)

Category	No of Persons	%
Teachers	34	11
Assistant Teachers	15	5
Administrative Staff	116	38
Field Staff	142	46
TOTAL:	307	100

Source: ENA's file, August 1989.

The Professional Qualifications of ENA's Staff

Academic Level	No. of Persons	%
M.Sc. in Ag Education	1	2
M.Sc. in Animal Nutrition	1	2
M.Sc. in Food Technology	1	2
Agronomic Engineers	15	31
Veterinary Sciences	1	2
Chemical Engineer	2	4
Biologist	1	2
B.Sc. in Business Administration	2	4
Agronomists	18	37
Agr. Mechanics	2	4
Civil Engineering Technician	2	4
B.Sc. in law students	2	4
B.Sc. in math students	1	2
TOTAL:	49	100

SOURCE: ENA's file, August 1989

ANNEX 6.

ENA's WATER MANAGEMENT CURRICULUM
(Two year course)

Subjects	Credits
a. Basic	
Mathematics	6
Physics	6
Chemistry	5
Technical Drawing	2
Total Credits	19
b. Technological	
Plant Physiology	3
Soils	6
Ag climate	2
Ag machinery	3
Plant Protection I and II	10
Irrigation Systems Designs	6
Computerization	2
Soil-water-plant relationship	3
On-farm Irrigation System	4
Ag Technology I, II and III	17
Experimental Design	4
Postharvest Management	6
Thesis	10
Total Credits:	76
c. Socio-Economic:	
Ag Business Administration	3
Marketing	3
Technology Transfer	6
Irrigated Ag Technology Transfer	6
Ag enterprise planning	3
Seminars	6
Total Credits:	21

Source: Departamento de Planeamiento. ENA Agosto 1988

ANNEX 7.

WATER MANAGEMENT PROJECT
PUBLIC SECTOR SHORT TERM TECHNICAL ASSISTANCE
(1988 - 1989)

ENA	D-H
Dr. Carlos Burgos Document No. 15, August 1988: Desarrollo Institucional de la ENA. 9-17 August, 1988	7
Dr. Otto Samayoa Document No. 17, September 1988: Desarrollo Institucional de la ENA. 2-6 September, 1988	4
Dr. Federico Poey Planificación de la Unidad de Generación y Transferencia de Tecnología de la ENA. 19-30 September, 1989.	10
 CENTA/CENCAP/REGIONS/DGRD	
Ing. Carlos Rivas Document No. 14, June 1988: Comunicación Educa- tiva. 25 May thru July 26, 1988	45
Ing. Carlos Crisostomo Document No. 13, August 1988: Diagnostico de la Agricultura Bajo Riego para diseñar proyectos de Investigación y Transferencia de Tecnología. June 1 thru July 30, 1988	43
Ing. Anthony Clark Document No. 55, January 1990: Propagación de Plantas y Flores Ornamentales. 15-18 August, 1989	4
 CENTA/ENA/DIVAGRO	
Ing. Jorge A. Mendez Comercialización y Manejo Postcosecha del Melon, Pepino y Chile. 22-23 May, 1988	2
Dr. Carlos Burgos Document No. 18, June 1988: Mesa Redonda sobre Investigación en Agricultura Bajo Riego. March 30 thru June 1, 1988	3
 OSPA/DGRD/REGIONES	
Dr. Otto Samayoa Document No. 10, July 1988: Banco de Datos:	

Formacion de Archivos para la Informacion sobre el area de riego y area potencial.

Document No. 16, August 1988: Banco de Datos: Formacion de Archivos del CENTA y de la DGRD en Agricultura Bajo Riego.

Document No. 19, September 1988: Banco de Datos Tomo II. Manual para la Construccion de una Base de Datos en Agricultura Bajo Riego.

Document No. 24, October 1988: Banco de Datos Tomo I. Manual para la Construccion de una Base de Datos en Agricultura Bajo Riego.

Dates:	28-29 April 1988	2
	25-27 May 1988	3
	June 27 thru July 1, 1988	5
	25-29 July, 1988	5
	August 29 thru September 1, 1988	4
	27-31 October, 1988	5
Ing. Jose Maria Carrillo (AID direct contract)		60
Document No. 28, Feb. 1989: Comercializacion Agricola. From Dec 1, 1988 thru March 1, 1989		
Dr. Otto Samayoa (AID direct contract)		56
Document No. 29, March 1989: Caraccterizacion de la Agricultura Bajo Riego en El Salvador. From October 24, 1988 thru January 20, 1989		
Boleta para el Sondeo Exploratorio al Sector Reformado del Diagnostico de Caracterizacion de las Areas de Riego.		
Lic. Jose Adan Rodriguez		7
Lic. Osccar Campos		7
Lic. Carlos Gonzalez		7
Document No. 33, March 1989: Seminario Taller Sobre Elaboracion de Politicas de Riego, 4-10 March, 1989		
Ing. Vicente de Jesus Serpas		25
Document No. 46, October 1989: Impacto de la Capacitacion del Proyecto Manejo de Aguas en los Agricultores de El Salvador. 11 September, thru October 17, 1989.		

Water Management Project Coordination

Dr. Federico Poey
Programacion e identificacion de Consultores 9
de Tiempo Corto y Coordinacion de actividades con
el Sector Privado. November 1987.

Preparacion de Tematica relacionada con Investigacion 6
y Extension de los Cursos Cortos Programados.
December 1987.

Preparacion de la Estrategia de Transferencia 10
de Tecnologia a Agricultores e Instituciones
relacionadas con el uso y el manejo de aguas.
Feb. 22 thru March 4, 1988

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ANNEX 8

TECHNICAL ASSISTANCE PROVIDED TO THE PRIVATE SECTOR (DIVAGRO)
BY THE AGRIDEC COMPANY

1987

Nelson Gonzalez	November-December/87
Roberto Poey	6 days
Federico Poey	3 days

1988

Nelson Gonzalez	January-December/88
Antonio Elizondo	12 days
Pablo Rioseco	September-December/88
Roberto Poey	10 days
Roberto Fulton	2 days
Roy Champagne	3 days

1989

Federico Poey	18 days
Roberto Fulton	8 days
Pablo Rioseco	January/89
Nelson Gonzalez	January-December/89
Jose Quezada	7 days
Oscar Orozco	22 days
F. Rodriguez	5 days

ANNEX 9

PERSONAL COMMENTS ON PROJECT PROGRESS (By Dr. G. Hargraves)

Reasons for slow irrigation development considerations for further planning and recommendations for short term consulting assistance.

In the preparation of the Project Paper for the Project, based on consultation with DGRD, OSPA, FUSADES and others, several reasons for the slow progress in irrigation development and the lack of emphasis on non-traditional crops were described. An attempt is made to list some of these reasons in their order of importance:

1. Lack of confidence due to security conditions and due to the policies of GOES.
2. A decline in market price and demand for traditional products such as cotton and sugar.
3. Inadequate transfer of appropriate technology for new crops.
4. Shortage of trained personnel for irrigation development at all levels.
5. Inadequate commercialization of potential new agricultural crops.
6. Failure of GOES To formulate practical policies for the management of the public sector projects and to provide good support for the private sector for irrigation.
7. Inadequate political support for irrigation development, crop production and marketing.
8. Difficulties encountered in obtaining reliable basic information on natural resources, market demand, profitability, and prices.
9. Inadequate availability of financial support for irrigation development.
10. Less than adequate legal structure and regulations related to water development.
11. Lack of pilot activities to demonstrate profitability of non-traditional crops.
12. Poor linkage of production to local needs and to export markets.
13. Difficulties in access to eastern U.S. markets and problems

related to transport of crops (particularly perishable crops).

More than half of the above restraints were addressed in the Project Paper and agreements. Very significant progress has been made. Interviews with officials and personnel of the various agencies indicate satisfaction with the quality of the technical assistance, and emphasis are worth mentioning.

If all other factors are equal, yield and quality are determined by the interactions of fertility and climate. Interviews have indicated that cases of failure to produce export quality due to too long a period between irrigation applications or a period of moisture stress and, in one case of adequate irrigation, a deficiency in the fertilizers applied.

DGRD (Dec '89) indicated the area with irrigation infrastructure to be 38,500 Ha of which 17,325 is irrigated (14,553 in pasture, 1906 in sugar cane and coffee, and 866 in non-traditional crops). A reported 90% of fruits and vegetables consumed in El Salvador in 1988 were imported from Guatemala. An estimated 7,000 Ha of irrigation would be required to provide complete import substitution of these products.

The GOES needs considerable technical assistance in order to find ways of increasing the utilization of the existing irrigation facilities and in analyzing the areas suitable for producing fruits and vegetables so as to partially provide import substitution.

Some comparisons of man hours required in crop production in California for good yields (about 50% above average) in 1951 and for average yields in 1986-87 are given as follows:

Man Hour Required per Ha		
Crop	1951	1986-87
Asparagus	208	370
Avocados	197	325
Cantaloupe	307	573
Cauliflower	254	402
Cotton	75	55
Grain Sorghum	71	27
Rice	28	30
Strawberries	1974	3189

There is an urgent need for technical assistance in order to make a careful evaluation of the potential in El Salvador, based on climate, soils, and water supply, for producing fruit, nut, berry, vegetable and other specialty crops. For those for which a good market demand is indicated, detailed plans need to be developed and

promotion policies considered.

The Project has produced a "Guia Tecnica para la Produccion de Frutas y Hortalizas Bajo Riego" (April 1989). The production guide describes procedures for producing melons, cucumbers, watermelon, tomato, green peppers, chile peppers, plantain, pine apple, okra, broccoli, elotillo, green beans, and ejote. Some separates for crops have been prepared. These instructions are a good start but need modifications for local conditions of soils, climate etc. Various state and other extension and agricultural agencies have bulletins on the majority of these crops. An organized effort to obtain publications from these sources could provide significant benefits towards improved crops production and also for marketing.

DGRD has completed studies of irrigation projects for an area totaling 67,081 Ha of which the works have been completed for 11,000 Ha. Negotiations are in progress with the objective of obtaining financing from the Intern American Development Bank (IDB) for the financing of significant new irrigation activities. It is anticipated that some new large gravity irrigation projects will be financed and constructed within a relatively short period of years. Technical assistance and training needs to be designed to optimize benefits from increased labor and income from these proposed projects.

Prior to the unrest and uncertainties created by the armed guerrillas of the FMLN the collection of hydrologic and meteorologic data in El Salvador was considered to be superior to programs in other Central American countries. These data are now being placed in the Data Bank. The present field organization and equipment for these activities has been described as significantly less than adequate for future agricultural development requirements.

FUSADES obtains market information on a regular basis. A linkage to the public sector data bank has not as yet been formalized.

DGRD has published a "Politica Nacional de Riego". This document describes the history of irrigation development and recommends the administration of irrigation projects by the farmers.

The emphasis on irrigation planning for new projects appears to be mainly on engineering feasibility. The feasibility of producing a given crop depends upon soils, climate, water supply, and market demand and profitability. In El Salvador mean temperatures vary from about 27 c near the coast to about 15 c at elevations above 2,000 m. The daily temperature range near the ocean is about 14 c and about 7 c at elevation 2000 m. This results in favorable climates adaptation for a wide range of crops. Unfortunately there are few economical sources of significant water suppliers at the higher elevations.

A comparison was made of labor requirements, gross crop value and net profit per Ha for good yields of California crops (about 50% above average) using 1951 data. The values are averages for 15 vegetable crops, 16 fruits, 9 grains (various field beans, flax, sorghum, oats, rice, and wheat), and four field crops (alfalfa, cotton, potatoes, and sugar beets). The results are presented as follows:

Labor Requirements, crop values and Profits by Crop.
(1951 Prices)

Type of Crop	Man Hrs/Ha	Gross Value/\$Ha	Net Profit \$/Ha
Vegetables	524	1669	435
Fruits	424	1556	678
Grains	45	321	109
Field Crops	132	1056	581

Generalizations should be used with caution and analyses need to be made on a crop by crop basis. However, the general comparisons indicate the need to promote crops with high labor requirements and the better levels of net profits.

The Política de Riego is a good start, but the document indicates a need for more planning on ways to implement farmer management, promotion of the most suitable and desirable crops and improved access to market information.

There is a need to continue with planning and development of large gravity irrigation projects. However, project settlement and development may proceed slowly and if such development is rapid, the benefits may be reduced significantly by poor crop selection.

The process of project development can be significantly improved through the conjunctive use of ground and surface waters and by initial development making use of wells and river pumps. In this manner the areas selected for large gravity projects can develop a knowledge of irrigation technology and of the processing and marketing of non-traditional or specialty crops several year prior to the completion of the construction of the major project facilities.

This initial or pre-project development can be greatly facilitated if dependable supplies of electrical energy can be made available in the proposed project areas.

In January 1987, a technical assistance team prepared "An Evaluation of the Zapotitan Irrigation and Drainage District".

Project rehabilitation and transfer of administration to the farmers was recommended. The team emphasized the potential advantages of making electrical energy available for pumping. As conditions of security permit, consideration needs to be given to providing electrical energy in essentially all areas of significant potential for irrigation.

Progress in promoting and implementing local administration of the project and in promoting production of high value, labor-intensive crops is considered to be fundamental for improving support for continued financing of gravity irrigation projects.

The Project has provided some short term consulting services. Discussion with ENA, CENTA, DIVAGRO and GEMA has indicated a need for additional professional assistance in the following subjects:

1. Soil fertility with emphasis on the micro elements
2. Postharvest technology for vegetables and ornamentals
3. Organization for administration, management and maintenance of irrigation projects.
4. Use of computers and the organization and management of data related to data bank operation.
5. Preparation of an improved curriculum for training in irrigated crop production.
6. Selection of books and publications for library support of teaching and research related to irrigated crop production.
7. Integration of field research with computerized methods of crop selection and crop modeling.
8. Potential benefits from use of regional and world wide climatic data base materials.
9. Analyzing, generalizing and statistically evaluating results from various ongoing research activities.
10. Evaluating proposals for proposed post graduate research.