A.I.D. EVALUATION SUMMARY PART I

(BEFORE FILLING OUT THIS FORM, READ THE ATTACHED INSTRUCTIONS) PD-ABI-539

IDENTIFICATION DATA

A. REPORTING A.I.D. UNIT: USAID/G-CAP/ENR (Mission or AID/W Office)

(ES#)

B. WAS EVALUATION SCHEDULED IN CURRENT FY ANNUAL EVALUATION PLAN? yes ☐ slipped ☒ ad hoc ☐

Eval. Plan Submission Date: FY 93 Q 4

C. EVALUATION TIMING 8°023 interim ☐ final ☒ ex post ☐ other ☐

D. ACTIVITY OR ACTIVITIES EVALUATED (List the following information for project(s) or program(s) evaluated; if not applicable, list title and date of the evaluation report)

Project #	Project/Program Title (or title & date of evaluation report)	First PROAG or equivalent (FY)	Most recent PACD (mo/yr)	Planned LOP Cost ('000)	Amount Obligated to Date ('000)
520-0274	Highlands Agricultural Development Project Phase II		9/93	32,100	31,816

ACTIONS

E. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

	Action(s) Required	Name of officer responsible for Action	Date Action to be Completed
1)	Follow-through Project 520-0404 Community Natural Resource Management, to continue with 30 watersheds In Guatemala. Various aspects of HAD II on small irrigation System, reforestation, soil, conservation, private sector agricultural extension service CARE I contractor.	Stacy Rhodes, DIR William Sugrue, ENR	9/30/97
2)	Follow-through Project 520-0403 Trade and Laber Relations Development Project, Agricultural Research Fund (ARF), Integrated Agricultural and Environment Protection Program (PIPA/A), and Marketing, to continue marketing aspects with small farmers and the Guild of Exports of Non-traditional Products for export non-traditional crops.	Stacy Rhodes, DIR Kim Delaney, TRIO	8/31/98
3)	As corollaries, the RENARM (Regional Environmental and Natural Resources Management Project) and Farm-to-Market Access Roads Project 520-0332 will give technical assistance on IPM and road rehabilitation in several watersheds.		3/95

(Attach extra sheet if necessary)

APPROVALS

F. DATE OF MISSION OR AID/W OFFICE REVIEW OF EVALUATION: mo 8 day 26 yr 93

G. APPROVALS OF EVALUATION SUMMARY AND ACTION DECISIONS:

	Project/Program Officer	Representative of Borrower/Grantee	Evaluation Officer	Mission or AID/W Office Director
Signature	Raymond W. Waldron	Fernando [illegible]	Margaret M. Kromhout	William Stacy Rhodes
Typed Name	Raymond Waldron		Margaret Kromhout	
Date:	4.21.94	Date:	Date: 5-5-94	Date: 5/24/94

MINISTERIO DE AGRICULTURA Y ALIMENTACION

H. EVALUATION ABSTRACT (do not exceed the space provided)

The HAD II Project (1989-1993) was the third part of a long-term USAID activity in Guatemala to help small and medium sized farms in the highlands to become more fully integrated into the economy at large. Small scale irrigation systems and the diversification of cropping systems towards non-traditional export agriculture resulted in the construction of 275 small-scale irrigation systems involving 6,718 families who are irrigating 2,863 hectares in 7 regions. In order to assure sustained production in the irrigation systems, a watershed management component involved over 6,000 hectares which were protected by soil conservation practices with over 150 ha of community forests established, and integrated watershed management programs in 10 watersheds. Marketing efforts with INDECA, the Ministry of Agriculture (MAGA) marketing agency and the Guild of Exports of Non-traditional Products (GEXPRONT), resulted in the establishment of 26 farmers' markets and open channels for international export of produce. Credit through the national agricultural bank (BANDESA) was made available for irrigation, agricultural production and marketing. Pest management training and extension were promoted through the MAGA extension services (DIGESA and DIGESEPE) and the formation of a privatized technical assistance group, FEAT. Technical assistance in forestry was provided by CARE and DIGEBOS. Several other organizations were funded in the project to provide organizational support. Six separate surveys and evaluations of HAD II were carried out between 1990 and 1993, which attempted to assess the state of agriculture in the immediate sphere of influence of the project and its impacts on farmers, institutions, and the national external debt. The final evaluation was almost completely based on these surveys. The first baseline survey was eliminated due to faulty design. Several other surveys were of questionable experimental design and of little value. The baseline and final survey dated 1991 and 1993, however were adequately designed to provide a data base on a wide variety of factors. However, due to the nature of agriculture, surveys separated by only 2 years should not be considered to reveal trends in agricultural practices. Therefore, the results should be combined to provide descriptor functions, but not comparative parameters. A wide variety of factors measured in the surveys included ethno/social factors, agriculture production, soil conservation and water use, earnings, costs of production, household expenditures, credit assistance and technical assistance, marketing systems, demographics, and education status of participants. Due to the quantity of questions (about 800) and certain statistical uncertainties, plus poor data labelling and incomplete chart titles, it was extremely difficult at best to realize a full understanding of the results of the surveys without considerable additional scientific analysis of the data base. Therefore, the summary of evaluation findings, conclusions and recommendations in part J of this form reflect an additional review of key parameters used in the final evaluation. Parameters of questionable or unclear interpretation are not included.

I. EVALUATION COSTS

1. Evaluation Team Name	Affiliation	Contract Number OR TDY Person Days	Contract Cost OR TDY Cost (US$)	Source of Funds
Edgar Nesman	Consultant			
Hugo Orellana	Consultant	520-0274-C-	Estimated	
Steve Stewart	Consultant	00-0214-00	in $96,000	USAID
Guillermo Pedroni	Consultant			
José González	FIRE/México			

2. Mission/Office Professional Staff Person-Days (estimate) 40

3. Borrower/Grantee Professional Staff Person-Days (estimate) 120

2

A.I.D. EVALUATION SUMMARY PART II

J. SUMMARY OF EVALUATION FINDINGS, CONCLUSIONS AND RECOMMENDATIONS (Try not to exceed the 3 pages provided)
Address the following items:

- Purpose of activity(ies) evaluated
- Purpose of evaluation and Methodology used
- Findings and conclusions (relate to questions)
- Principal recommendations
- Lessons learned

Mission or Office: USAID/G-CAP Date this summary prepared: 04/18/95

Title and Date of Full Evaluation Report: Highlands Agricultural Development Project

1. Purpose of the activities evaluated. The goal of the HAD Project was to enable the rural sector to make a greater contribution to national economic growth, and to improve rural living standards, employment and incomes via sustained increase in production, marketing and export of non-traditional agricultural commodities and preservation of Guatemala's natural resource base within a framework of joint public and private sector participation. The Project purpose was to increase sustainable agricultural productivity and profitability. This was to be accomplished through the development of diversified commercial agriculture, expanded emphasis on irrigated farm systems, soil conservation, flexible credit for production technology and marketing to small farmers. Research and support for export-oriented marketing services was developed to enhance the sustainability of agricultural production via improvement of pest management, and watershed conservation. HAD II was the third component of a long term USAID effort which started in 1983, and is continuing via the Community Natural Resources Management Project. HAD II predecessors were the HAD I project, and the Small Farmers Diversification Project.

There were many Sector/Program Constraints in the Guatemalan Highlands including **Structural Deficiencies** such as political turmoil and a 30 year civil war, land tenure inequities, an exploding population, inadequate credit and investment incentives, and low rural employment. In addition, marketing opportunities for poor people were few, storage and processing plants for agricultural products were inadequate, there was a substandard rural road system, a lack of adequate natural resource management, inadequate water accessibility and energy distribution and almost universal poor public health which presented extremely large constraints. **Institutional Inadequacies** facing the agricultural sector were the result of factors caused by an over-extended public sector, insufficient budgets, declining private sector investment, low numbers of trained agriculturalists and struggling farmer associations. **Policy Inadequacies** were among the most serious obstacles to improved growth, efficiency and investment in the agricultural sector. These inadequacies included general macroeconomic policies (monetary, fiscal, exchange trade), specific sectoral policies on land distribution, water use, pricing, research, budgets and bureaucracies. The Highlands Agricultural Development approach since 1983 attempted to deal with these constraints, and as experience was gained, USAID/Guatemala continued to refine its approach to solving these development problems.

2. Purpose of the evaluation and methodology used. The propose and methodology used for the impact evaluation followed Project guidelines, including a "grant financed impact evaluation to verify if the project purpose was achieved." Other specifications were an initial baseline sample survey of the project area, periodic surveys during the life of the project, and a final impact survey. The content inquiries of the surveys were "characteristics of the farm households, cropping and livestock patterns and yields, soil conservation and water use, household incomes, purchases, expenditures and consumption, credit and technical assistance received, marketing patterns, family characteristics, education, literacy and the role of women and children. The overall goal of the final impact evaluation was to document the impact of the HAD Project at the beneficiary level in terms of changes in agricultural practices, agricultural production, agricultural income, and levels of living. At the institutional level, the evaluations tried to measure changes in the capacity to deliver services to the farmers, and at the national level in terms of changes in labor utilization, food availability and nutrition, increased income, conservation of natural resources, productive infrastructures, and international balance of payments. Six separate studies were carried out. There was: a baseline study in 1990; a study of the situation of participants in the FEAT Program (Special fund for Technical Assistance); case studies of certain selected families living in project irrigation districts; an Institutional Impact study; a National Impact Study; a Watershed Management Study, and the final evaluation survey.

SUMMARY

3. Findings and Conclusions: The 1990-1992 surveys were separated by less than 3 years. This is not enough time to survey watersheds, organize people into watershed districts, install wells and irrigation systems, introduce new crops, build processing infrastructure or marketing systems in terms of measuring differences before and after the project. Therefore the data base is essentially non-comparative, and the 1990-1992 surveys should have been combined in order to understand the situation in the project area in the year 1992.

Indicators of Project accomplishments are limited, but nevertheless, indicators do exist that have a reasonable level of confidence in interpretation. For example, at the farm level, there have been changes in use of agricultural practices as a result of HAD II, although many of the farmers indicate that they already used most of the modern practices before the project started. The major shift was in the application of these practices to commercial crops and in a more exact manner. There are indications that 2/3 of the farmers in the project had positive increases in production and crop value. There were some instances of increased capacity to deliver coordinated services by government institutions to the farming community. The constant instability of the government agencies seems to have had a demoralizing effect throughout the system. The FEAT program for privatized technical assistance in agriculture appeared to be more successful than project intervention by the Ministry of Agriculture, probably because of better cash flow at the grass roots level and the fact that the farmers had to buy the Technical Assistance, and the technicians depended on farm profits for their own incomes. Due to the paucity of valid statistical inference in the survey, it is not possible with any degree of certainty to accept survey interpretation in the evaluation as to whether household conditions were improved by the project, but rather the data should serve as a descriptor of the conditions at the end of the project. The evaluation indicated that there appears to have been a slight but positive change in levels of living in certain household indicators. While not statistically significant, in relation to the number of years in the projects, the trend of change is apparently favorable with most homes experiencing at least one positive change in the home.

The farms of the beneficiaries are small, with an average cultivated area of 1.3 hectares. Slightly less than 0.32 hectares were under irrigation, which was about 39% of the total land planted. There was no significant change in the reported area planted in 1990 and 1992. There was slightly more land irrigated in 1992 than in 1990. The average area irrigated in 1990 was 0.28 hectares and 0.32 ha in 1992. In terms of agricultural production, it was found in the 1992 survey that 97.4% of the farmers used chemical fertilizer, 84.1% used insecticides, 84.1% fungicides, 69.6% compost, 65.8% used improved seed, 51.3% used herbicides, 24.5% had constructed terraces, 26.6% had diversion ditches, 24.5% had planted erosion barriers, and 19.1% had constructed erosion barriers. There was a slight positive relationship between project participation and the use of recommended agricultural practices. The correlation between the number of years and the number of practices in soil conservation was slightly statistically significant. Farmers that were in the project between 4 and 6 years used 5.6 practices while those with less than 4 years used 4.9 practices and those with more than 6 years used 5.5 practices. The majority of the farmers in the HAD program reported an increase in crop value in 1992 as compared to 1990. 65.3% had at least some increase in crop value and 53.4% had an increased value of more than $185.00 per farm. This increase can be traced to increased production as well as the adoption of higher value crops. The prevailing farming system remained a subsistence agriculture of corn and beans, with non-traditional crops used in the irrigation systems.

Technical Assistance at the farm level was one of the main components of the HAD Project. This was directed at making the maximum use of irrigation to increase crop production and diversify in the direction of commercial crops. More than half of the farmers (57.5% interviewed in 1992) reported that they had received technical assistance during the last crop year. This was an increase of 3.6% from those reported in the baseline survey of 1990. This increase was not statistically significant. The farmers in the HAD priority areas reported a statistically higher number of technician visits than those in the non-priority areas.

It was reported that 42.3% of the farmers in the project had received **Bank Credit** over the past three years. Nineteen percent had used credit only one of the three years, 8.6% for two years, and 13.8% for all three years. Sixty percent of the farmers had credit experience prior to their entrance in the HAD II project.

Conservation, Watershed and Pesticide Management were important components in the HAD Project. There is evidence of increased use of soil conservation practices. There is also evidence of increased use of pesticides as a result of project activities. Importantly, there is evidence of increased use of precautions by those applying pesticides. In the Case Studies, it was found that 70% reported using gloves while applying pesticides. Most farmers still do not use enough precautions. Several of the more toxic non-EPA approved pesticides are being used by the farmers. It was found that some 50% of the irrigation systems were short of water at the end of the irrigation cycle. During the Case Study investigation, farmers at the upper elevations in the watersheds reported that they did not get enough water. The farmers often felt that they did not have enough control of the water source for a secure future. Reasons for not enough water in the Project were poor original design of the systems, constantly escalating costs of electricity for pumping, and lack of knowledge and finances for maintenance.

In 1993, 73.8% or 1,698 of the projected 2,300 farmers participated in the planning and implementation of Project activities. The personnel of CARE, DIGEBOS, and the Peace Corps completed the preparation of management plans for 20 watersheds. Eighty-four of 88 existing watershed committees received training including talks and field trips, with a few additional demonstrations and short courses. Farmers have indicated increased knowledge and interest as a result of the training activities. Fire control training has been useful, but there was no indication of the existence of organized fire-prevention brigades in any of the areas studied. There have been fewer plantings for firewood and construction lumber than anticipated. 281,300 tress were planted, with an estimated survival rate of 72%. Approximately 40% of the farmers interviewed buy firewood and only 29.8% use firewood exclusively from their farms. 88 forestry management groups have been formed. The average size of the groups is 25 persons. Most of the groups have a work plan, and about 2/3 of the groups indicated that they follow the plan. Women participated in some of the activities sponsored by almost half of the groups. Women were full members in 37% of the groups. The technicians and promoters of DIGEBOS have demonstrated capability in the design and supervision of project activities. Twenty two technicians and 24 promoters were trained in planning and design.

Institutional Impacts. There were some indications of increased institutional capacity to deliver services to farmers as a result of the Project. The Institutional Study recognized that the Ministry of Agriculture agencies were responsible for improvements in farmer-government relations. The Institutional Study determined that the personnel of DIGESA and BANDESA worked out ways of coordinating their efforts so that the new irrigation projects could be established. They also worked out coordinated efforts to make production loans available. The Project's organizational and administrative structure (PDA-UAP) was perceived as an obstacle rather than a factor contributing to success in the HAD Project. There was little evidence that there had been any improvement in management and decision making in the Ministry of Agriculture as a result of the Project. There also was little evidence that the increased capability of providing information through an established information system contributed to the use of this information for administration and decision making purposes. In terms of **National Impact**, the increases in agricultural production that have come from Project efforts made a positive impact on the majority of those that have participated, yet about one-third of the farmers interviewed felt that their situation became worse because of their participation. They cited the debts from irrigation system installation and electricity charges as well as failure to find proper markets for their crops as reasons. The Project had no effect on downsizing the Guatemalan external public debt, but may have had some unknown and unquantified effect on the international balance of payment due to increased production of non-traditional agricultural export crops. In the environmental area, the evidence of impact is modest although the creation of PIPAA gives a legal basis for control of agricultural production and the use of agro-chemicals. Also, the scientific research sponsored through ARF and ICTA/CATIE-MIP has the potential to provide improved methods in integrated pest management and providing training materials for farmers.

SUMMARY (continued)

4. Principal Recommendations and Lessons Learned

a. The 10 year combined length of the HAD I, Small Farmers Diversification, and HAD II Projects addresses the reality that improvements in agriculture are long term phenomenon, and a decade of USAID participation in the three Projects has resulted in real improvements. **Planning and Design** of Projects however, must coincide with a master calendar of events for other parallel and predecessor projects, so that gaps in funding and implementation are avoided. The delays in starting HAD II created a significant loss in momentum which was not recovered until the end of the Project in certain areas, such as loans to farmers. The lengthy delays between the closure of the Small Farmers Diversification Project, and pragmatic action in the field of HAD II exemplifies the need for coherent continuity between projects.

b. Since the first two projects had successfully created an administrative template that worked, there was little need to create a new bureaucracy in the HAD project. When USAID and the host governments build a body of actions that work, they should not be abandoned with each new program. For example, the formation of the administrative unit (PDA-UAP) created a politicized bureaucracy apart from the Ministry of Agriculture (MAGA) that generated hard feelings concerning cashflow and delegation of responsibility.

c. The size and geographical reach of the project became too extended in HAD II. The first two phases of the USAID effort were considered to be successful partially because they were geographically limited. The decision to amplify HAD II to cover the entire country except the Petén contrary to repeated and concerted recommendations from personnel within the previous projects diluted the effectiveness of the 10 year effort and created a non-government bureaucracy that created significant problems in organization and resource allocation, plus resentment from the Ministry of Agriculture. Therefore, it is recommended to limit the size of projects, and

K. ATTACHMENTS (List attachments submitted with this Evaluation Summary; always attach copy of full evaluation report, even if one was submitted earlier)

ATTACHMENTS

Final Evaluation Combined Report
Case Studies of Small Irrigation Beneficiaries

L. COMMENTS BY MISSION, AID/W OFFICE AND BORROWER/GRANTEE

Cont.....

concentrate on smaller geographical areas with more money and technical assistance per unit area.

d. Frequent errors were committed in the planning of water needs, irrigation system design, and estimating water pumping costs that inhibited the program significantly. Correct planning and engineering at appropriate levels of technology are mandatory.

e. Interagency coordination was relatively easy to accomplish at the level of technicians working together in the field, but cooperation seemed to break down at the intermediate administrative levels, generally in this case due to political influences and a lack of clear definitions of functions and resource allocation.

f. Better pesticide management needs to be implemented immediately, and this can be improved by requiring research oriented institutions to provide extension materials to agricultural extension agents and farmers based on sound evidence. USAID should work on how to enforce pesticide laws and statutes in order to control misuse of pesticides from manufacturer to user.

g. Planning by objectives is a valid means to assure cooperation between agencies, and to understand what other agencies are doing.

h. Micro-farm enterprises involved in the production of non-traditional export commodities are at an inherent disadvantage to enter the macro-economic driven international export markets, and strong viable and long-term associations and cooperatives within the small-farm communities are necessary to become competitive.

i. Local agricultural technicians need to be trained in marketing, credit procedures, and how to organize farmers groups.

j. Privatized Agricultural Services appear to be successful because there is an economic dependency of the technicians on farm income compared to a competitive vacuum in the public sector. Care must be taken to balance assistance to both private and public sector agricultural extension agents to avoid a brain drain from the public sector and keep jealousies to a minimum.

k. USAID officials in charge of a project have the obligation to closely oversee the initial phases, especially survey designs, and to try to ensure that projects do not become politicized. In the beginning of each project, careful attention from the AID direct hire official in charge is mandatory to see that project managers are aware of USAID and host country regulations.

l. Fewer, but better scientifically based surveys are mandatory. The HAD II project was overevaluated and overmonitored. The M&E funds would have been better used if diverted to helping farmers solve their practical problems in irrigation and resource management.

HIGHLANDS AGRICULTURAL DEVELOPMENT PROJECT

FINAL IMPACT EVALUATION COMBINED REPORT

September, 1993

Dr. Edgar G. Nesman
Consultor for LBII

Prepared for AID by Louis Berger International, Inc.
Under Contract No. 520-0274-C-00-0214-00

Working Draft
22 August 1993

HIGHLANDS AGRICULTURAL DEVELOPMENT PROJECT

IMPACT EVALUATION

TABLE OF CONTENTS FOR COMBINED REPORT

9

I. EXECUTIVE SUMMARY

1. Project Purpose and Description. The Highlands Agricultural Development Project (HAD) began in 1983 as an agricultural diversification project designed to raise small farmer incomes and increase the flow of hard currency into the country by raising and exporting non-traditional agricultural products. One component included support for small irrigation systems and soil conservation practices for groups of farmers to allow them to more fully utilize lands, especially in the dry season. In 1985 the project area was expanded to include more area but still within the North Western part of the highlands. The early phase of the Project was considered successful enough to be expanded to cover all of the country except Region VIII (The Peten). In 1990 further modifications were made in project goals and operations to include watershed management, private sector marketing, agricultural research, and integrated pest management, while continuing the earlier emphasis on small farmer irrigation systems and conservation practices for non-traditional export crops.

2. Purpose and Methodology of Impact Evaluation. The purpose and methodology used for the impact evaluation follows the guidelines found in the project documents. The earliest document call for a 'grant financed impact evaluation to verify if the project purpose was achieved' Later documents specified 'initial baseline sample surveys of the project area; periodic surveys during the life of the project; and a final impact survey.' The content areas for areas were outlined for the evaluation: 'characteristics of the farm households... cropping and livestock patterns and yields; soil conservation and water uses; household incomes, purchases, expenditures and consumption; credit and technical assistance received; marketing patterns; family characteristics, education, literacy, and the roles of women and children.'

The overall goal of the final impact evaluation was to document the impact of the HAD Project at the beneficiary level in terms of changes in agricultural practices, agricultural production, agricultural income, and levels of living; at the institutional level in terms of changes in the capacity to deliver services to the farmers; and, at the national level in terms of changes in labor utilization, food availability and nutrition, increased income, conservation of natural resources, productive infrastructure, and international balance of payments.

To meet the evaluation goals a combination of methodologies was used in the design of six separate studies. An Impact Survey was designed to include the same representative sample used in the Baseline Survey of 1990 with an additional inclusion of farmers that are in the FEAT (Special Fund for Technical Assistance). Case Studies were designed to cover issues that are not easily covered in a survey such as: household economy, labor utilization, women's roles, variations in irrigation methods, integrated technical assistance, and pesticide management practices. An Institutional Impact Study was designed to study the impact of the Project on the capacity of public and private institutions to deliver services to the farmers. A National

Impact Study was designed to look at the aggregate impact of the project at the national level. A FEAT Study was designed to do an indepth study of the effect of privatized extension services. Finally, a Watershed Management Study was designed to measure the impact of the activities outlined for the 20 micro-watershed areas covered by the Project. Each of the studies was done separately and the results are synthesized in the findings that follow.

3. Findings and Conclusions

Overall Impact: At the farm level there has been a net positive effect on agricultural practices. The changes are most notable for conservation practices and for farmers that have participated for more than three years. The impact on agricultural production and crop value is more evident with two-thirds of the farmers reporting an increase in production value in absolute terms with a medium value increase of 44.7% in the two year period between 1990 and 1992. This in turn gives higher farm income and improvement in levels of living. This can be noted in changes in housing and household items with an average of one improvement per household in construction items as well as one item in household equipment. The institutional impact is not as clearly defined nor as evident as the findings at the farm level. There is not consistent evidence of an improved capacity to deliver coordinated services. The FEAT program of privatized extension services has reached the early stages of institutionalization and shows real possibilities for the future. The aggregate impact at the national level is more impressive with an estimated crop value of Q87,326,810 in 1992 as compared to Q67,998,840 in 1990; an estimated value of irrigation infrastructure of Q39,076,312; an increase in the value of export crops from ¤2,900,000 in 1990 to ¤4,900,000 in 1992 which has a direct relation to the international balance of payments.

Personal and Household Characteristics: A profile of the HAD beneficiaries is found in the following personal characteristics: 65% 'Indian"; 75% married; 69% Catholic; 23% Protestant; husbands age, 43 and 66% with some primary education; wives age 39 and 50% with some primary education; household size, 6.8 persons; 30% of men work some off farm and 10% migrate. The housing characteristics can be summarized as follows: adobe walls, 72%, dirt floors, 48%; running water, 55%; and latrines, 85%. Also, 25% have bicycles; 9% with trucks; 4% with motorcycles and a few had cars. The families served by the FEAT privatized extension service had slightly different characteristics: higher proportions 'Indian'; more Protestant; higher work migration, adobe walls, and dirt floors; and younger in age, lower proportions reporting legal marriage, less formal schooling, fewer latrines, fewer sewing machines, and much less electricity.

Farm Characteristics: The average cultivated area reported was 1.8 manzanas and less than one-half manzana was irrigated. Almost all farmers reported some agricultural equipment with sprayers and dusters the most common. Most farms had some animals with cows and chickens the most common. The farmers in the FEAT were much the same in most farm characteristics except they

reported less farm equipment. There were few changes in average cultivated area during the last few years but there has been a slight increase in irrigated area.

Agricultural Production: Most of the farmers used chemical fertilizer, insecticides, fungicides, conservation compost, and improved seed. A lesser number reported terraces, ditches, and other conservation measures. There has been some change in agricultural practices during recent years but more in the application to commercial and export crops. There has been a marked increase in plantings of commercial crops and the increased crop value is directly related.

Technical Assistance and Credit: The increased production value is closely related to the shift in the type of crops grown and the application of improved agricultural techniques, yet few of the beneficiaries attribute this directly to the technical assistance that they have received from public sector institutions. To the contrary, they are generally critical of the service although more than half of them indicated that they had received help in the last year. In contrast, the farmers served by the FEAT technicians recognized its value and felt that it was an important part in their success in increased production and income estimated at over 200% in the first year.

Almost half of the farmers reported the use of production credit within the last three years. Even a higher proportion indicated that they had credit experience in the past.

Conservation, Watershed and Pesticide Management: Conservation practices such as terraces, compost use, and soil erosion protection barriers have become part of the regular cultivation practices of the beneficiary farmers. There is also evidence that the farmers are using some precautions in their use of pesticides. Yet, the Case Study and FEAT Study investigations conclude that there is a general degradation of the environment as a result of the intensified cultivation which depends highly on the use of agrochemicals. There is also evidence that some of the water sources are now being overused so that there is insufficient water to give adequate coverage to all of the farmers at some times in the season. The watershed areas defined for activities under this project do not completely correspond to the same areas where the irrigation projects are located. Farmer beneficiaries do not feel directly responsible and that they can not afford to spend a great deal of time on activities that have no immediate economic payoff.

Institutional Impact: Although there are a few indications of improved institutional capacity to deliver farm level services in the public sector as a result of the HAD Project, the results of the investigation are generally negative. The government institutions are perceived as suffering a great deal due to the economic and social problems within Guatemala in the last decade. At the same time that the HAD Project was trying to help in coordinated service delivery, there is evidence that the general resources available to the institutions from regular sources was almost non-existant. The administrative structure previously

available and established to coordinate Project activities was not seen as adequate and even perceived by many as an obstacle. Demoralization and professional envy were common as resources seemed available and abundant from some and not for others. There is no clear administrative structure at this time for continuation of the Project, yet the farmers and field technicians are committed to continue and often have made investments that do not allow them to walk away. In contrast to the public institutional structure, there seems to be an internal structure in the FEAT program that is becoming institutionalized although it is felt that it can not stand alone and needs to be related in some way to the public sector either through the credit or technical assistance offices.

National Level Impact: Although some of the farm and institutional level impacts from the HAD Project are modest and do not reach the goals expected, the aggregated results at the national level are impressive. In labor utilization, 87% of the families use family labor and 70% use hired labor for a net increase in local labor utilization and a decrease in seasonable migration. Although there has been no marked change in dietary habits, there has been a slight increase in subsistence crop production that produces the bulk of family nutrition and a 36% increase in vegetable production which contributes both directly and indirectly to nutrition. The increased value of rural productive infrastructure is also impressive and estimated at 39 million Quetzales. The increased rural production value has increased from an estimated 68 million Quetzales in 1990 to 87 million Quetzales in 1992. The conservation of natural resources is difficult to quantify on a national level yet there are 88 working groups organized and functioning through the country working in 20 micro-watershed areas that were not there before. National guidelines have been established for the use and control of pesticides that can help prevent some of the environmental problems in the future. The increase crop production now accounts for 14% of the horticultural exports and represents a 4.9 million dollar value for the international balance of payments. Finally, it is difficult to measure the indirect impact of the project but the there is a noticeable increase in vegetable production, conservation activities, training of public and private sector technicians, exposure to markets, etc., as a result of the HAD Project.

4. Lessons Learned and Recommendations. There are a number of lessons that can be taken from the HAD Project experience that have design and application implications for future projects. The lessons with planning implications can be summarized in the following topic areas: -the need for periodic project reprogramming; -the importance of longer project time periods; -the adequate use of productive infrastructure; -the success of smaller sized project units; -the danger of increasing the scale of smaller successful projects; -the need to clarify target populations at planning time; and, -the need for comprehensive studies of water sources in irrigation projects.

The lessons related to project organization and administration are summarized as: -the breakdown of interagency coordina-

tion and cooperation; and, -problems related to organizational structures and external development assistance.

The lessons related to project operation are summarized as: -the difficultly in early adoption of pesticide management practices; -farmer motivation based on concrete economic benefits; -conflicting roles imposed on agricultural technicians; -the importance of group organization skills; -the effective use of planning by objectives; and, -the need for combining production and marketing technology.

The lessons related to impact measurement and evaluation are summarized as: -the difficulty of obtaining project impact measures; -the difficulty in obtaining accurate income information; and, -the utility of further analysis of project results.

Finally, the lessons related to alternative development strategy are summarized as: -the impact of export cropping on small landholders; -changing roles of women; and, -the viability of privatized agricultural services.

II. HIGHLANDS AGRICULTURAL DEVELOPMENT PROJECT

COMBINED IMPACT EVALUATION REPORT

A. PROJECT HISTORY AND DESCRIPTION

The Highlands Agricultural Development Project (HAD-I) was first initiated in the early 1980's as a regional and experimental one. In 1988, as the experimental project was ending, a second stage, HAD-II was initiated. The second stage was expanded to cover most of the country whereas the first one was concentrated in a much smaller area.

The Highlands Agricultural Development Project in Guatemala was initiated to help meet some of the urgent needs found in the rural areas. This area has best been described as one with "widespread poverty" as evidenced by: high population density and population growth that approaches 3% per year; a dependent population with 43% under the age of 15 years; educational facilities that are inadequate with 36.5% of those beyond school age who have not finished primary and a rate of illiteracy that is estimated at 77%; 30% of the population that do not speak Spanish, which is the principal language of formal schooling and of the government service agencies; sanitary toilet facilities are lacking in 84% of the rural households; agriculture that is characterized as 'minifundia' with many families on very small plots of land that are below the subsistence level; approximately 70% of the population of the area classified as 'rural' with an average farm size less than 5 acres; rapid migration of Highlands people to the capital city; and a decrease in total agricultural production which results in a negative balance of foreign trade. (Nesman 1991)

HAD-I

The Highlands Agricultural Development Project, Phase I (HAD-I) which began in 1983 had as a goal the improvement in the productive resource base of the rural poor in the Central and Western Highlands of Guatemala. It included: improving access roads maintenance, creating a pilot reforestation program and constructing small scale irrigation and soil conservation systems. In 1985 the project's original territory was expanded. It also increased activities in soil conservation and small scale-irrigation systems. (AED 1991)

At the same time that the HAD-I project was operating, the Small Farmer Diversification Systems Project was also in progress which emphasized agricultural research, extension, credit and marketing. This project also was building model farms and strengthening the agricultural research institutes. Its goal was to increase the production and marketing of non-traditional horticultural crops and increase intensive livestock production on family farms in the Northwestern Highlands. (AED 1991)

Prior to the formal planning for the HAD-I project, there was a growing realization that changes were needed in agricultural production. Land was limited so that changes in technology seemed the best solution. Some of the local farmer groups had

already found ways of making changes with the help of private cooperative organizations and government extension workers. One aspect that worked particularly well was the development of small irrigated plots for growing non-traditional crops for export. The highland climate was particularly favorable for vegetable crops. At this point the government, with assistance from USAID and other international agencies, initiated the formal planning process of the HAD-I project. Funding for this project was provided through a USAID loan with detailed stipulations for its use.

The HAD-I project was regionalized in the Northwestern Highlands so that most of the agency level planning was carried out in the same area that the farms were located. From the very beginning, community groups were formed to plan and later operate the local irrigation system. Although the general parameters for the project were established by the government and international agency donors, the actual plan for day-to-day operation was guided by input from the farmers.

The original plan was flexible and was modified as needed and as new resources became available. Later, funds became available for drilling wells so that new community irrigation systems could be established in areas where streams were not available. New marketing opportunities developed so that different crops could be grown. The results of the HAD-I project were favorable and served as an experimental or pilot project stage for the planning of HAD-II.

HAD-II

The problems and needs of the remainder of the Guatemalan Highlands were not unlike those found in the Northwestern part. In reality, they were more acute due to the isolation of some of these remaining areas and the difficulty for government services to reach them. The same needs were also expressed by farmers in other areas of the country not considered as part of the Highlands. As a result, the planning now began to focus on all of the country where small irrigation systems might work. The only area not included was the Peten in the far Northeast due to isolation and low population density.

The second phase was called by the same name (HAD-II). The scope of the new phase is best described in the project documents: "Phase II of the HAD Project combined both the concepts of the Small Farmer Diversification Systems Project and Had I with the exception of the roads component. The geographical coverage expanded into all the regions except Region VIII....(with)... 275 miniriego projects that were funded by the project since the beginning up to the end of 1990. Watershed management was added as a major component which has combined the soil conservation and reforestation elements. The small-scale irrigation systems (miniriegos) that are the core of this project rely on the watershed for their viability. If the watershed is improperly managed, the availability of adequate water supplies for the expansion of irrigation systems will be affected". (AED 1991:2)

In 1990 further additions were included which increased the

resources allocated for watershed management, private sector marketing and agricultural research, and integrated pest management. ...the coordinating unit comprised the Vice Minister of Agriculture, the UAP project administrator, and the USAID chief ORD. This group attempted to guarantee appropriate coordination, participation and support from both the USAID offices and the implementating agencies of the government at both the central and regional levels..... The lower level teams of technical agents with each region contained members from the participating agencies (EIMATS). They attempted to meet frequently to jointly solve the technical and marketing problems of the individual miniriegos..... The regional agricultural development committees (COREDA) met periodically to coordinate and manage the activities of the six agencies within the miniriego project". (AED 1991)

Further revisions were made in 1992 which gave priority to 180 of the irrigation areas and place more of the decision making within the structure of the Ministry of Agriculture. Management by objectives was used to direct the activities of specific projects and USAID funds were dispersed directly to the Guatemalan government.

LIST OF REFERENCES

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B. IMPACT EVALUATION DESIGN

The design of the impact evaluation was initiated with a review of Project documents. Some of the relevant sections of the documents are presented in following paragraphs:

> "During the initial period of the project, prior to initiation of project activities at the field level, grant funds will be used to undertake a complete project specific and socioeconomic baseline study of areas to be included within the project..... The contracted team will obtain baseline data against which project targets and progress indicators can be measured at later dates.....
>
> During the last year of project activities a grant financed impact evaluation will be undertaken to verify if the

impact evaluation will be undertaken to verify if the project purpose was achieved, and when the attainment of goals is possible. Also analysis of discrete project activities will be undertaken to ascertain whether the interventions in fact contributed to the target group's productivity." (USAID 1983:53)

"Project impact upon target farmers will be assessed by means of a three-phase program consisting of: Initial baseline sample surveys of the project area; Periodic surveys during the life of the Project; and a final impact survey.

The objective of the baseline survey will be to collect information describing the characteristics of the farms households, and rural communities to be affected by the project and relevant to its goals and purposes; cropping and livestock patterns and yields; soil conservation and water uses; household incomes, purchases, expenditures and consumption; credit and technical assistance received; marketing patterns; family characteristics, education, literacy, and the roles of women and children. The information will be used (1) to aid in the design of project activities best adapted to local circumstances; and, (2) to provide a data base against which subsequent changes wrought by the project may be assessed by surveys in the final impact evaluation.

The baseline survey will be undertaken as early as practicable during the first year of the project. A plan will be developed to determine the most effective schedule for surveys to be undertaken in each of the project areas. The final impact survey is planned for the second half of the last year." (USAID 1988:91-92).

A partial Baseline Survey was conducted in 1985 with 33 completed interviews as part of an indepth study that focused on household economy. The data was processed and tabulated but had not been analyzed in depth until recently to see how it might be used in the final impact evaluation.

A more complete Baseline Study was initiated in 1990 by PRODESARROLLO under contract with LBII, including completed interviews with 491 participants in the HAD Project that were selected through standard probability sampling techniques. The study generated detailed demographic information and descriptive data on all aspects that were outlined in the original project paper. The original contract did not include statistical analysis so that it has only recently been examined in terms of it's usefulness in the final impact evaluation. The analysis of these and other data sources are the basis for the recommendations outlined in the following paragraphs.

IMPACT EVALUATION DESIGN

The overall goal of the final impact evaluation is to docu-

ment the impact of the HAD Project at the beneficiary and community level, at the service institution level, and at the national level. Stated in another manner, the questions that guide the final impact evaluation of the HAD Project are --- What is the impact of the Project ---

-- at the beneficiary level in terms of changes in agricultural practices, agricultural production, agricultural income, and levels of living?

-- at the institutional level in terms of changes in capacity to deliver services to the farmers? and,

-- at the national level in terms of changes in labor utilization, food availability and nutrition, increased income, conservation of natural resources, productive infrastructure, and international balance of payments?

It was evident that a combination of evaluation methodologies was needed if all of the impact questions were to be answered. Many of the questions and the corresponding indicators could be investigated directly on the farms at the beneficiary level. If a representative sample of the beneficiaries were interviewed, then the data could also be aggregated and expanded to the institutional and national levels to help measure the impact at those levels.

There were other items that could only be measured at the institutional and national level if they were to be evaluated. This required a different kind of investigation and a number of special studies were needed in addition to the farm level survey.

Specific questions were allocated to six separate studies, each with its own methodology. These studies are briefly listed below in terms of the questions to be answered and the methodology to be used.

1. Impact Survey

The questions for the impact survey follow closely those outlined in the original project documents -- as a result of HAD project intervention, what changes can be found in:

-crop production and value
-farm characteristics
-cropping systems
-irrigation use
-cultivation practices
-harvesting and marketing practices
-pesticide use and control
-farm animal production
-conservation practices (not included in Baseline Studies)
-credit use (not included in Baseline Studies)
-training and technical assistance
-personal and family characteristics
-levels of living
-community participation (not included in Baseline Studies)

The following guidelines were used in developing the methodology for the impact survey: follow the sampling design as prepared for the 1990 Baseline Survey so that the same 491 beneficiaries can be reinterviewed; follow the same sampling procedures to draw an additional sample of 100 beneficiaries from the FEAT Service areas for interviewing and comparative analysis; follow the format and wording of the 1990 questionnaire and suggest ways for eliminating questions of doubtful reliability and validity with the goal in mind of reducing the number of items; include suggestions for items that could be better included in case studies; and, add retrospective questions (not to exceed (25) that can be used to indicate changes in agricultural practices and production prior to 1990.

2. Case Studies:

The case studies were designed to cover a number of Project components or expected outcomes that are not easily determined with quantified data collection alone. These areas were grouped together for a more qualitative approach using case study investigation. The areas included are: household economy, labor utilization, women's roles, irrigation types, integrated technical assistance, and pesticide management.

The methodology for the case studies used the following guidelines: select a sample of 10-12 irrigation groups that fall within the list selected for the survey sample and considering a mix between priority and non-priority service areas, pump vs gravity fed irrigation systems, and regional distribution; conduct structured informal group interviews ('sondeo') with a representative sample of 10 organized groups in the program; and, conduct structured informal interviews with from 2 to 5 (based on the size of the irrigation group) beneficiary families selected as representative from the groups that are interviewed (there should be a minimum of 30 families interviewed).

3. Institutional Level Study

In the revised project plan of 1988 there were 23 activities listed for the Project. These activities were to be carried out by a number of different institutions, mostly within the Ministry of Agriculture. In the revision of 1992, the list of activities was consolidated and simplified so that priorities could be outlined. The revised list of activities and related institutions are as follows: technical assistance for agriculture (DIGESA); technical assistance for animals (DIGESEPE); technical assistance for forestry (DIGEBOS); privatized technical assistance (FEAT); crop investigation (ICTA); marketing (INDECA); and credit (BANDESA). There are also a number of auxiliary organizations that give organizational support (LBII, CARE, UAP, PEACE CORPS, ETC..).

The specific goal of the Institutional Study is to measure the impact of the Project on the different institutions involved

in terms of present and future capacity to deliver services to the farmers. Also, it is important to determine the impact of the auxiliary organizations and the organizational structure on project operation.

The methodology used for the Institutional Level Study included the following guidelines: review statistical information on beneficiary impact from 1990 baseline and 1993 followup surveys; and summarize the results of informal structured interviews conducted with key institutional personnel.

4. National Level Study

This study is designed to cover a number of Project components or expected outcomes at the national level such as: changes in labor utilization, food availability and nutrition, increased income, conservation of natural resources, productive infrastructure, and international balance of payments.

The following guidelines were used for developing the National Level Study methodology: use the relevant statistical data from the beneficiary level surveys to estimate the impact at the national level; use statistical information from other sources related to study questions; and, interview project personnel and key individuals in other agencies to get comparative social and economic information.

5. FEAT (Special Fund for Technical Assistance)

The specific goals for the final impact evaluation of the technical assistance offered by the FEAT component include the same ones that apply to the Public Sector which seek to document changes in: use of recommended agricultural practices, agricultural production, agricultural income, and levels of living at the farm level. In addition, the FEAT evaluation seeks to document the impact of privatized technical assistance when compared to that of the Public Sector in terms of cost, willingness to pay, and perception of utility by the farmers.

The study methodology was developed with the following guidelines: conduct structured informal group interviews ('sondeo') with a representative sample of at least 12 of the organized groups in the program; and, conduct structured informal interviews with at least two individuals selected as representative from the each of groups that are interviewed. In addition, a parallel study will be conducted as part of the Impact Survey of HAD beneficiaries which will include 100 farmers in the FEAT project areas.

6. Watershed Study

The impact evaluation of this component is related to the goals and activities outlined for the 20 micro-watershed areas covered by the program. These included extension and training

CARE who was also responsible for the design and completion of the impact evaluation of this component.

The design was based on the measurement of project impact as measured by: the improvement of soil, water and forest resources; new knowledge and skills the participants have obtained in the areas of agricultural, forestry and environmental practices; the level and quality of key forestry and agricultural practices that have been adopted and replicated; the general benefits that can be noted from the perspective of the beneficiary; and, how sustainable is the present level of activities after project termination in September 1993?

The study methodology was developed using the following guidelines: use of an appropriate method of gathering information in order to answer the questions; use of interviews with participants and technical personnel; an evaluation of the adequacy of field methods used by the technicians; and, use of field observation of agroforestry, forestry, soil conservation, and group organization activities.

C. FINDINGS AND CONCLUSIONS

The following synthesis includes all of the above mentioned studies. Each of the studies is available in its entirety as a separate volume and the executive summaries of each one is included with this report as an annex.

Although the methodology varies between studies, many of the same topics are investigated by more than one study. The varied methodologies give an opportunity to detect aspects that one study and one methodology alone might not pick up. The synthesis is organized by topic areas in the following order: Impact Overview; Personal and Household characteristics; Farm Characteristics; Cropping and Livestock Patterns; Credit and Technical Assistance; Conservation, Watershed and Pesticide Management; Institutional Impact; and, National Impact.

1. OVERALL IMPACT

At the farm level there have been changes in use of agricultural practices as a result of the project although many of the farmers indicate that they already used most of the modern practices (ie.: fertilizer, insecticides, fungicides, etc. etc.,) before the project started. The major shift is in the application of these practices to commercial crops and in an more exact fashion.

A more measurable change can be found in the increase in agricultural production and crop value among the project beneficiaries. Even in the short two year period between the 1991 and 1993 surveys, it was found that two-thirds of the farmers had a positive increase in production in absolute terms. The medium increase in value was 44.7% which is well over the 14.2% inflation rate. It was also found that the increased crop value was

increase in value was 44.7% which is well over the 14.2% inflation rate. It was also found that the increased crop value was closely related to additional commercial crop production rather than traditional subsistence crops.

The increase in crop production and value that the project beneficiaries have also been reflected in living conditions. There have been significant improvements in house construction (wall, roof and floor) and in home facilities (water, toilet and lights). Also, improvements can be noted in household equipment such as radios, television, sewing machines, refrigerators, gas stoves, electric irons, clothing closets vehicles and bicycles.

These changes at the farm level can also be noted at the national level with an increase in value of agricultural production value estimated at Q87,326,810 in 1992 as compared to Q67,998,840 in 1990. In that almost all of this increased value is found in commercial crop production, it represents a change in estimated export value of 4.9 million dollars in 1992 as compared to 2.9 million in 1990 and a direct positive effect on international exchange and balance of payments.

The increase in agricultural production also represents additional food for consumption at home. Not all of the vegetable crops grown are destined for export but may find their way into the local market as well as used for home consumption. Although the increased production of commercial crops is significant, the value of traditional subsistence crops has continued at much the same level (even with a slight increase in absolute level) so that a net total increase of food products is available for local consumption.

The investigation of project impact on service institutions has not rendered as favorable report although there are some instances of increased capacity to deliver coordinated services at the farm level. The many of the farmers were not favorable when talking about the technical assistance that they had received nor were they ready to recognize that the improved practices and increased crop production came from the recommendations given them by government service agents. The constant changes in administrative and organizational structures within the project and the Ministry of Agriculture seem to have had a demoralizing effect throughout the system. Interagency coordination was lacking in most cases yet there were some irrigation groups where irrigation, crop research, agricultural extension, credit, forest and water conservation, and marketing technicians worked together to provide integrated development assistance.

The FEAT program for privatized technical assistance has already proven itself as a workable approach and shows even more promise for the future. There were high hopes for the SISE information system in the early days of its establishment as a project emphasis and after a period of difficulties and lack of perceived value, it now has the capacity to provide information for future agricultural decision making and there in renewed interest among public sector institutions to continue its use.

2. PERSONAL AND HOUSEHOLD CHARACTERISTICS

The majority (65.3%) of the HAD beneficiaries are 'Indian' by self definition and more than half (53.6%) of them speak a dialect in the home. The two major groups represented are Mam (39.8%) and Cakchiquel (30.3%) with lesser numbers of Quiche (14.5%), Aguateco (10.0%) and a few Jacalteco and Achi. Most of the couples are married (75.3%) although a number also reported a 'free union' relationship (15.7%). The predominant religious affiliation was Catholic (68.5%) although there are also many Protestants (22.5%). The average age of the farmers was 43 and his wife 39. The majority of farmers had some primary (65.5%) although almost one-fourth reported no schooling (23.8%). The women had less schooling with almost one-half (49.9%) with none. The proportion of school age children that attended school was higher for boys (80.9%) than for girls (78.1%). The household size averaged 6.8 members. Work migration was reported by 10.2% of the men and to a lesser degree for the women and children. The men did report some off-farm work (29.5%) during the year but women and children less. There were many families (38.0% that also reported self-employment during the year with 29.2% of the men and 15.0% of the women. There were also a few families (9.5% that reported money sent by children living away.

In terms of housing characteristics, most of the houses had adobe walls (71.5%), although there were some with blocks or bricks as well (19.4%). Dirt floors were most common (48.3%), followed by cement (36.9%) and a few with tile (11.0%). More than half (55.2) of the homes had their own water supply and a smaller proportion (26.9%) shared the water supply with neighbors. Sanitary toilets were reported by 85.0% and 24.8% reported making improvements on their homes.

Different means of transportation were also reported: 24.5% had bicycles, 8.6% had pickup trucks, 3.8% had motorcycles, and a few (1.4%) had cars.

The families that are participating in the FEAT program show some differences in a few personal and household characteristics. When compared to the people served by the public sector, those in the FEAT areas: are more likely to be Indian (75.3%); are less likely to be legally married (62.3%); more likely to be Protestant (38.0%); slightly younger (38 years old); more likely to have no formal schooling (33.3% vs 23.8%); and more likely to migrate for work 19.5%).

In terms of housing characteristics the Farmers in the FEAT program were more likely to have houses with adobe walls (81.8%); more likely to have tile roofs (55.8%); more likely to have dirt floors (76.6%); less likely to have running water (37%); less likely to have a sanitary toilet (75.3%); and much less likely to have electricity (7.8%).

In terms of household equipment, the Farmers in the FEAT program were much less likely to have Television (5.2%): much less likely to have sewing machines (19.5%); much less likely to

have a refrigerator (1.3%); less likely to have a gas stove (6.5%); much less likely to have an electric iron (5.2%); and much less likely to have a set of furniture (3.9%).

The following changes in living conditions have been noted giving an indication of the impact of the HAD project on the lives of the beneficiary and their families:

There has been a slight but positive change in levels of living as measured by selected household indicators. A series of questions were included in the Impact Survey of 1992 asking about key housing materials and services before and after entrance in the PDA program. There were six items that were combined to form an index to measure change. There was a positive change in all six of the items with an average change of .342 points on the combined index. The changes recorded for the individual items were: wall construction, 10.9%; floor material, 16.2%; roof type, 7.1%; water source, 18.5%; toilet facilities, 56.1%; and. lighting, 31.4%.

There has been a positive change in levels of living as measured by changes in household equipment between 1990 and 1992. Ten identical questions were included in both the 1990 and 1992 surveys concerning the ownership of selected household equipment. The items and the corresponding changes are as follows: radio, 3.4%; TV, 5.5%; sewing machine, 4.8%; refrigerator, 3.1%; gas stove 2.1%; electric iron, 2.4%; clothing closet, 12.3%; electric equipment, -1.9%; auto 1.2%; and bicycle 5.7%.

While not statistically significant, in relation to the number of years in the project, the trend of change is favorable with 77.9% of the 421 homes experiencing at least one positive change in the home.

Regarding the number of household items such as radios, television, sewing machines, refrigerators, gas stoves, irons, closets, vehicles, and bicycles, there is an average increase of one item per household, though this increase is not related statistically to the number of years of participation. The greatest change can be noted in the number of closets, radios and bicycles.

3. FARM CHARACTERISTICS

The farms of the beneficiaries are small with and average cultivated area of 1.8 manzanas. Slightly less than one-half manzana (0.457) was under irrigation which was 38.8% of the total land planted. A few of the farmers (14.7%) did not irrigate any crops in 1992 and at the other extreme, 11.9% had no other plantings than those that were irrigated.

Almost all of the farms (98.1%) reported some kind of agricultural equipment or construction. Most often reported were: sprayers, 81.9%; dusters, 78.1%; grain silos, 22.6%; drying floor, 21.1%; storage shed, 19.0%; plow, 17.3%; stable, 16.9%; cart, 11.6%; and water pump, 7.4%.

Most of the farms (89.5%) also had some kind of animals. The proportion of farmers reporting each type of animal and the average number on these farms is as follows: cows, 50.8% reporting with and average of 7.3 on each of those farms; horses, 25.1% and 1.6; donkeys, 7.4% and 4.5; pigs, 43.4% and 2.5; sheep and goats, 16.4% and 4.5; and, poultry, 80.7% and 15.6.

When compared to regular HAD beneficiaries, the farmers in the FEAT program had fewer plot of land; their land was generally more hilly; they were more likely to have plows (24.7%); less likely to have sprayers (63.6%); and less likely to have drying floors (14.3%).

The following changes in farm characteristics have been noted that give indications of project impact in this area:

There was no significant change in the reported area planted in 1990 and 1992. The area reported in 1990 was an average of 1.822 manzanas and in 1992 it was 1.800 manzanas. Upon closer analysis, it is found that 35.4% reported no change in the two year period, 32.1% reported less land planted and 33.5% reported more land planted.

There was slightly more land irrigated in 1992 than in 1990 but the difference is not statistically significant. The average area irrigated in 1990 was 0.403 manzanas and 0.457 manzanas in 1992. With additional analysis it is found that 41.8% of the farmers had no change in area irrigated from 1990 to 1992, 26.4% reported less land, and 31.8% reported more.

There was some change noted in land tenure. Most of the farmers own the irrigated land but there are a few that do plant on rented land. The total land planted and irrigated remained much the same from 1990 to 1992 but the percentage of rented land was reduced from 30% to 26% in this period.

4. AGRICULTURAL PRODUCTION:

A number of key production and conservation practices were included for field investigation in the impact survey. It was found that the level of use was as follows: chemical fertilizer, 97.4%; insecticide, 84.1%; fungicide, 69.6%; compost, 65.8%; improved seed, 65.6%; herbicides, 51.3%; terraces, 29.7%; diversion ditches, 26.6%; planted barriers, 24.5%; and, constructed barriers, 19.2%.

When the priority areas are compared to the areas that did not receive as much technical assistance after 1991, it is found that they reported significantly more use of herbicides, live conservation barriers, fungicide use, and combined agricultural practice change. The increased value of there agricultural production is higher also but the difference is not statistically significant.

The comparative crop value of the most important commercial

crops in 1992 is as follows: 'brocolli', 368 Quetzales in the priority area vs 561 Quetzales in the nonpriority area; 'arveja china' 302 vs 139; 'zanahoria, '64 vs208; 'tomate', 1239 vs 1886; 'repollo',105 vs 256; 'coliflor',217 vs 196; 'cebolla', 120 vs 880. Coffee was also mentioned with a comparative production value of 848 vs 210.

There is a positive relationship between project participation and the use of recommended practices. 'Project participation' was measured by the number of years that the farmer had been in the project. 'Use of recommended practices' was measured by how many of the 10 selected agricultural practices the farmer was presently using. The correlation between the number of years and the number of practices was slight but statistically significant.

Some agricultural practices are more closely related to project participation than others. A closer examination of the 10 practices included in the index shows that five of the practices have a strong positive relationship with project participation (use of: terraces, living barriers, compost, herbicides, and insecticides). The remaining five practices do not show a positive relationship to project participation (use of: dead barriers, chemical fertilizers, fungicides, and improved seed).

The strongest relationship between project participation and use of recommended practices is for those farmers who have been in the project from 4 to 6 years. A closer examination of the number of years in the project shows that farmers that have been in the project between 4 and 6 years are using 5.6 practices while those with less than 4 years are using 4.9 practices and those with more than 6 years are using 5.5 practices.

There has been an overall increase in agricultural production value. The sample has experienced an overall increase in the value of agricultural production. Nearly two-thirds of the farmers had a positive increase in agricultural production value in absolute terms, 53.4% had a positive rate of change, and the median increase in value was 44.7%, well over the 14.2% inflation rate. Also, the percentage of farmers producing over Q20,000 increased from 7% to 9%, and one-third of the farmers had an increase in production value of 100% or more.

The increased production value is closely related to commercial crop production. The increase in agricultural production value was achieved through increased value of production in commercial crops, not subsistence crops, which remained basically static. This demonstrates that the project has had a positive effective in its principal area of focus, which is commercial crop production.

There is a negative relationship in project participation (as measured by the number of years in the project) and crop production value. There are indications, although the reasons are not clear, that the group of farmers who have been the project more than six years have done less well than those with five years or less experience.

There was considerable increase in crop value between 1990 and 1992 among the participants in the PDA project. The average crop value in 1990 was Q 2,974 and Q 4,305 in 1992. The difference between the two years is statistically significant. The crop value was calculated by combining all of the crops reported for the given year and using a standard unit value for each crop. All crops were included, both subsistence and commercial as well as irrigated and non-irrigated areas.

The majority of the farmers in the PDA program reported an increase in crop value in 1992 as compared to 1990. Most (65.3%) had at least some increase in crop value and 53.4% had an increased value of more than Q 1,000; some as high as Q20,000. There were 20.7% that reported the same crop value for the two periods.

The increase in crop value is positive even when the inflation rate is considered. The data was analyzed further to determine if the increase in crop value was greater than the official 14.22% inflation rate registered between 1990 and 1992. Subtracting this factor removed an additional 15 cases from those that reported a positive change in production value. Increasing the margin of inflation to as high as 20% still leaves 55.5% of the farmers with a positive crop value increase in 1992 over 1990.

The correlation between participation in PDA (as measured by the number of years in the program) and the change in crop value between 1990 and 1992 is positive but not statistically significant. Further investigation shows that those farmers that were in the project less than 4 years had the greatest change in crop value 1990 and 1992. For this group, the difference is statistically significant. This group of farmers represents 36% of the total sample interviewed.

The greatest change in crop value between 1990 and 1992 is related to commercial crops rather than subsistence. Upon closer inspection it was found that only 31% of the crops classified as subsistence had a value increase between 1990 and 1992 as compared to 53% of the crops classified as commercial.

5. CREDIT AND TECHNICAL ASSISTANCE

Technical assistance at the farm level was one of the main components of the HAD Project. This was directed at making the maximum use of irrigation to increase crop production and diversify in the direction of commercial crops for local and export markets. This technical assistance was to include marketing, conservation and watershed management, credit use, and pesticide management. The assistance was to be done through farm visits by extension agents and other experts and through short courses.

More than half the farmers (57.5%) interviewed in the impact survey in 1993 reported that they had received technical assist-

ance during the last crop year. This is an increase of 3.6% from those reported in the baseline survey of 1990. This increase is not statistically significant.

An additional question concerning experience with technical assistance prior to entering the project and a significantly larger proportion reported (65.6%) earlier experience. More disturbing are the results coming from the case studies where the dissatisfaction with public sector assistance was openly expressed. This was also found in the field visits during the Institutional study. Most farmers did not acknowledge that the new practices and increase in crop production were a result of the technical received. This disturbing information is not inconsistent with the findings from diffusion of innovation studies which have found that farmers are more likely to attribute their new ideas and practices to 'friends and neighbors' rather than official project sources.

In contrast to the above findings, the farmers in the FEAT areas recognized the assistance given to them by the paid agents and felt that they were an important part of their success in increasing production and income. Also, it is interesting to note that the farmers in the HAD priority areas report a statistically higher number of technician visits than those in the non-priority areas.

The use of production credit was also included in the investigation. Credit use during the previous three years was reported by 42.3% of the farmers. It was also found that 19.7% had used credit only one of the three years, 8.6% for two years, and 13.8% for all three years. Even a larger proportion of the farmers (60.6%) reported production credit experience prior to entrance in the project. There is a slight increase of 3.6% in credit use reported between the time of the baseline survey in 1990 and the impact survey of 1993 but this difference is not statistically significant.

There was a slight increase in reported technical assistance from 1990 to 1992. In 1990, 53.9% of the farmers reported that they had received technical assistance. This increased to 57.5% in 1992.

There was a considerable increase in reported production credit use among beneficiary farmers from 1990 to 1992. Production credit use was reported by 20.0% of the farmers in 1990 and 42.3% in 1992. The farmers were also asked if they had credit experience prior to their entrance in the PDA project and 60.0% answered to the affirmative.

6. CONSERVATION, WATERSHED AND PESTICIDE MANAGEMENT

Conservation and environmental issues were important considerations in the planning of the HAD Project. Special components for conservation, reforestation, watershed management, and pesticide control were included as part of the project activities. Attempts to measure the results of these efforts were included in

the Impact Survey, the Case Studies, the Institutional Analysis and the FEAT Study.

A number of key conservation practices were included in the field investigation in the impact survey. It was found that the level of use was as follows: compost, 65.8%; terraces, 29.7%; diversion ditches, 26.6%; planted barriers, 24.5%; and, constructed barriers, 19.2%.

There is evidence of an increased use of pesticides as a result of project activities. There is alsc evidence of increased use of precautions by those applying pesticides. In the Case Studies it was found that 60% of the farmers reported using rubber boots and 70% reported using gloves while applying pesticides. The use of masks was also reported. At the same time, many still do not use proper precautions and particularly contract workers may be the most vulnerable to the detrimental effects of improper use of pesticides. There is also evidence that some of the more toxic pesticides are still being used by a few farmers.

There may have been some additional negative environmental effects from the project. This is best stated in one of the conclusions of the ECOTEC investigation, "In terms of the program's negative aspects, the diversification in production towards non-traditional crops has brought changes in agricultural technologies, including an increase in the use of agrochemicals and more intensive soil use, which may have long term negative effects on the population."

There are contradictory views among the farmers that the additional cropping is 'wearing out' the soil yet they feel that the present high levels of production and income justify the practices that are being used. There seems to be a knowledge gap concerning the environmental impact of the recommended technical package. Some of the pressure to use increased agrochemicals seems to be coming from credit sources and crop buyers.

It was found that some of the irrigation systems are short of water at the end of the irrigation cycle. During the Case study investigation it was found that farmers at the high end often do not get enough water. The farmers often felt that they did not have enough control of the water source for a secure future.

There were also a number of findings from the Watershed study that are listed in the following paragraphs.

In 1993, 73.8% or 1698 of the projected 2,300 farmers participated in the planning and implementation of Project activities. At the same time, the personnel of Care, DIGEBOS, and Peace Corps completed the preparation of management plans for 20 watersheds. Also, 84 of the 88 existing watershed committees had received some kind of training which was included talks and field trips (70%) with a few additional demonstrations and short courses. Farmers have indicated increased knowledge and interest as a result of the training activities.

An estimated 345 hectares have been covered by the improvement/protection practices applied in the watershed areas. Conservation practices have been reported in 33.5% of the total area, reforestation in 31.4%, and forest improvement practices in 23.0%. At least two conservation practices have been initiated by 22% of those interviewed. The beneficiary farmers reported that lack of time and seed material prevented further increases in watershed activities. The pressure of time needed for income producing activities was a strong obstacle although the utility of compost production served as a motivation.

Fire control training has been useful but there was no indication of the existence of organized fire-prevention brigades in any of the areas studied. A number of the communities indicated that the training in fire control that had been part of the training events had been useful and in two occasions had been applied during the last year to control fires.

There have been fewer plantings for firewood and construction lumber among the project participants than anticipated. Of the 2,290-thousand trees proposed only 281.3-thousand have been established. The survival rate of these plantings is estimated at 72.%. Many of the farmers do not know exactly why the trees that were planted did not survive although lack of sufficient rainfall and the presence of leaf-cutting ants were mentioned as problems. The future management of present plantations is in doubt. There is some ambivalence among farmers about the role of DIGEBOS in forestry management and regulation.

There is only slight evidence of increased firewood availability as a result of the project. The project related plantings are still small and only 7.4% of the groups indicated any increase at the present time. Approximately 40% of the farmers interviewed buy firewood and only 29.8% use exclusively from their farms.

There is some evidence of increased crop production as a result of soil conservation practices among the participants. Increased production was reported by 14% of the farmers and this was attributed to soil retention, soil improvement, use of compost, green manure, and the elimination of burning residue. The farmers reported increase in yields of corn (26%), vegetables (24%), potatoes (12%), and beans (20%). There has been some indications of lower use of chemical fertilizers and 43% of the farmers report that they now use compost as recommended by the project. There has been some crop diversification as a result of the project including, improved pasture, 'maguey', flowers, fruits, and coffee, were mentioned by 8% of those interviewed.

Forestry management groups have been formed in many communities. Groups have been formed in 88 communities (of the 100 projected) which fit the cultural patterns of Occidente more than Oriente. The average size of the group is 25 persons. The composition of the groups is mostly male (61.2% male only). Some others do have women members (22.2%) and a few (16.6%) have only

women members. Most of the groups have a work plan and about 2/3rds of the groups indicate that they follow the plan. Most of these groups will require some assistance for continuation in terms of technicians and material resources although it is estimated that 22.2% are sufficiently well established to continue functioning on their own.

Women participate in some of the activities sponsored by almost half (48%) of the groups. Women are particularly active in the preparation and care of plant nurseries and are most interested in fruit crops and flower planting. Women are full members in 37% of the organized groups and recognize the need for more technical assistance that they feel could be best provided by women promoters.

The technicians and promoters of DIGEBOS have demonstrated capability in the design and supervision of project activities. As a result training and experience in the project, 22 technicians and 24 promoters have capacity in planning and design. Also, 14 technicians and 24 promoters have demonstrated ability in community group supervision and assistance.

7. INSTITUTIONAL IMPACT

As a result of the HAD Project, it was expected that there would be an increase in the capacity of the governmental institutions to help farmers improve their crop production, income, and levels of living. The results of this effort were included for measurement in the Impact Survey and the Case Studies. Also, a special effort was made to measure the results through the Institutional Study.

As a result of this investigation it was found that there has been some indication of increased institutional capacity to deliver farm level services. At the farm level there are indications that the HAD Project has helped in the improvement of farm production and income. Only 40% of the farmers interviewed in the Institutional Study recognized that the Ministry of Agriculture related institutions were responsible for the improvements, yet, within DIGESEPE there was agreement that the Project experience had helped in the process of establishing priorities; within DIGEBOS there is recognition that the Project had helped in the development of an integrated approach to watershed management; and, in DIGESA there was a recognition of a new methodology of planning by objectives that has now become the mode of operation.

There is also evidence that changes at the institutional level have resulted in improved agricultural practices, increased value of farm production land improved levels of living. The shifting emphasis in DIGESA and INDECA from basic grains to market oriented vegetable crops has been noted in all of the studies. The initiation of the farmers market experiment by INDECA can be seen in the 28 groups that have been organized in the San Martin Sacatepeque area. The establishment of a new experimental plots by ITCA is also an indicator.

There has been some evidence of institutional coordination and cooperation as result of PDA activities. The Institutional Study found evidence in the field that the personnel of DIGESA and BANDESA worked out ways of coordinating their efforts so that the new irrigation projects could be established. They also worked out coordinated efforts to make production loans available. The technicians of DIGESA and those of DIGEBOS also developed working relationships to deal with soil and water conservation issues. The experience in coordination of local planning for resource allocation and farm service delivery that came through the brief life of the EIMAT groups helped develop personal relationships among the technicians and with local leaders that has continued in some areas.

The Project's organizational and administrative structure was perceived as an obstacle rather than a factor contributing to success in the HAD Project. The Institutional Study found such expressions as: 'the coordinating committees did not meet so they could not function well'; 'there was always conflict between the different organizations'; 'there was little local participation'; 'there was a push to open new projects rather than make the older ones successful'; 'there was a parallel and competing structure of administration'; 'there was no working model for operations'; 'there was no structure for providing promised resources at the community level'; and a general feeling that there was a large number of committees and offices that were formed without a clear understanding of the unique role of each and how they were interrelated (ie: SPADA, CE, CT, UAP,SER, COREDA, COSUREDA, CNC, CTN, LBII, CATIE/MIP, PIPAA, SISE, FEAT, ETC., ETC..). Further, there did not seem to be a clear understanding of how each entity fit into a coordinated delivery system.

There has been little evidence of improved management and decision making in the related institutions as a result of the HAD project. During the Institutional Study, interviews were conducted at all levels of the Ministry of Agriculture and there was little evidence that there had been any improvement in management and decision making as a result of the Project. There was some recognition of an improved planning methodology in DEGESEPE through the process of prioritizing of work areas.

There is little evidence that the increased capability of providing information through an establish information system has contributed to the use of this information for administrative and decision making purposes. The Institutional Study found that there were high expectation early in the project that an information system would be established. Later, many of the institutions felt that the methodology was being imposed and was of little utility to them. As the project comes to an end there is renewed interest as the institutions see the capabilities. It was unclear to most of those interviewed as to what might happen to SISE in the future but the hope that it might be combined with parallel operations in other institutions so that it can be used.

8. NATIONAL IMPACT

It was expected that the HAD Project would also have a measurable impact at the National level. One of the expected results was increased crop production and particularly in commercial crops for export. At the National level, this increase would contribute directly to the economy and balance of payments. Another expected result at the national level was an increase in local labor utilization with less need for seasonal migration. It should also increase the total credit operation in the country.

An independent study of National impact was included as one of the evaluation methodologies. This study was based in part, on the use of farm level survey data that was expanded to the total Project population. It was also based on an investigation of national economic data from other sources.

In effect, all of the related studies confirm that there has been an increase in the utilization of family labor and at this time, 87% of the beneficiaries use family labor in crop production. In addition, 70% of the farmers now hire other workers from the community for periodic help.

Nutrition impact is partly reflected in the increase in plantings of subsistence crops. The number of plantings increased from 14,746 in 1990 to 16,812 in 1992 (with some farmers planting more than one crop during the year). At the same time, the value of vegetable crop production has increased during the same period by 36% which also has an indirect impact on household consumption.

The findings from the case studies indicate the farmers derive about two-thirds of their income from agricultural crops. The remainder comes from animals and other non-agricultural sources. The increases in agricultural production that have come from Project efforts have made a positive impact on the majority of those that have participated, yet about one-third of the farmers interviewed felt that their situation became worse because of their participation. They cited the debts from irrigation system installation and electricity charges as well as failure to find proper markets for their crops as reasons.

The results of the investigation at the National level also indicate that there have been notable results from the efforts in conservation of National resources. The area covered by soil conservation efforts between 1988 and 1992 is reported to have covered 23,384 hectares under the Social Payment system.

In the environmental area the evidence of impact is modest although the creation of PIPAA which gives a legal basis for control of agricultural production and the use of agro-chemicals. Also the investigation sponsored through ARF and the ICTA/CATIE-MIP program have provided improved methods that are now used in integrated pesticide management as well as providing a training mechanism for farmers.

The changes at the farm level can also be noted at the

national level with an increase in value of agricultural production value estimated at Q87,326,810 in 1992 as compared to Q67,998,840 in 1990. In that almost all of this increased value is found in commercial crop production, it represents a change in estimated export value of 4.9 million dollars in 1992 as compared to 2.9 million in 1990 and a direct positive effect on international exchange and balance of payments.

D. LESSONS LEARNED AND RECOMMENDATIONS:

The Had Project has had a comparatively long life span and has included many different activities. This and the combined methodology used for measuring impact have provided a number of useful lessons that can be useful for future project design and implementation. The lessons related to project planning are listed first, followed by those related to project organization and administration, then project operation, alternative activities, and ending with project evaluation issues.

Project Time. Expected results do not come in a short period. As was stated in one of the reports, "the first three years are for learning; the practice does not come until later". Part of the success of this project is because of the longer time duration.

Target Audience. This project again shows that the target audience must be clearly defined at the time of program planning if the activities are to be carried out without conflict. In this project, there were at least two targets groups defined, irrigation beneficiaries and mini-watershed areas. It was not always clear how the two were interconnected and how activities could and should be coordinated.

Comprehensive studies of the Water Source. Even though there were studies carried out in most of the areas, there are still instances where the water is not sufficient and where the ownership of the source makes the future uncertain. The costs related to pumping water with expensive electricity also needs to be considered at the planning time.

Project Scale and Duplication. Factors that give success on one scale may not necessary be the same needed to assure success at another scale. The first phase of the HAD Project was considered a success and did not have the problems of organization and administration that came as the project was amplified to cover the whole country. The problems of coordination and resource allocation became major ones as the project was amplified.

Saturation Points Require Reprogramming. As was noted, the watershed program has gone as far as it can go with the present personnel and will require changes to move ahead. The same thing could be applied to almost all present activities in the HAD project.

Coordination and Cooperation. Interagency coordination and cooperation is always difficult but may be easier to accomplish

at the level of technicians working together in the field but seems to break down at the intermediate administrative levels. This may be due to a lack of clear definitions of functions and resource allocation.

Organizational and Institutional Development. This project seems to have been relatively successful in spite of the difficulties in organizational and institutional structures. Applying external development assistance through existing governmental structures seems to 'water down' any possible impact at the farm level. Developing parallel structures may get the resources to the field sooner but the professional envy and demoralization in the governmental institutions may negate the results in the long run. More emphasize is needed in identifying and developing organizational alternatives that work.

Pesticide management. There seems to be two stages that operate in the adoption of pesticides. The first stage is in convincing farmers that the use of the new materials will help in increasing their production and income. The next stage is to impress them with the danger to their own health and the environment. The two do not necessarily go together and it may take more time for the second one to be adopted.

Evidence of Concrete Benefits. Farmers must be able to see concrete benefits almost immediately for them to willing to invest time and other limited resources in a new enterprise. This was found true in reforestation aspects but applies to other aspects as well.

Dual Role of Technicians. Technician are often called on to carry out conflicting tasks such as the Forestry agents also being required to control tree cuttings. It makes it difficult for them to work at the same time in a participatory way with the farmers for watershed conservation. Another similar situation arises when extension agents are called on to collect loan payments; it makes their other roles more difficult if not impossible.

Group Organization. This is one of the most important aspects that was mentioned in the evaluation studies yet is not an area that agricultural technicians are trained in.

Planning by Objectives. This has been identified among the technicians as an important lesson learned from the project. It is an aspect that can be emphasized in future projects and ongoing activities.

Production and Marketing Technology. This study emphasized again the importance of developing new marketing outlets to accompany the new crops and increased production.

Export Cropping and Small Landholding. Many of the criticisms of the effects of export cropping on small farmers, such as the gradual concentration of land in the hands of a few, does not seem to be true in this case. There does seem to be some increase in social differentiation where those fortunate enough to

have irrigated land move ahead of the others.

Use of the Increased Productive Capacity. It is estimated that the irrigation infrastructure created by the Project is capable of even higher levels of production than are now being realized. One of the barriers is the high cost of electricity in those areas where water is pumped. This is worthy of further investigation with possible policy implications.

Project Size and Successful Outcomes. It was noted in the field studies that the small irrigation projects seem to be more successful than the larger ones.

Women's Roles. Women have been increasingly involved in the agricultural and conservation activities in this project. There are indications that these new activities are in addition to the traditional household duties which means an additional burden. This area needs further study to determine if it a positive or negative outcome.

Privatized Agricultural Services. The success of the FEAT program indicates that it is a viable alternative to public sector technical assistance. It also may be the only way that present levels of assistance can be maintained or increased due to reduced government budgets and lowered bureaucratic efficiency. It also may be an effective means of providing experience that will improve the efficiency and accountability of public sector extension agents. This program needs to be carried further until it operates without subsidy and finds the needed connecting link with agricultural or credit institutions.

Further Analysis. This project seems to have produced more lasting results than most agricultural development projects. In addition to the investigation and analysis required for this report, further studies are justified to identify in more detail the factors that have worked together to produce these results.

Accurate Data On Farm Income. This study again confirms the difficulty in collecting accurate agricultural production costs and income at the farm level. Subsistence farmers do not keep exact records even on a single crop such as coffee. When they have multiple crops with multiple sales and varying inputs at different time throughout the year then can only give estimates. They also have other reasons that prevent them from giving accurate information to others about their economic situation.

Impact Measures. Exact impact measures are difficult to obtain unless accurate baseline data is collected early in the life of the project from both beneficiaries and a comparative group of nonbeneficiaries.

1. SUMMARY

The Ecotechnology Consulting Company (ECOTEC) was contracted to provide a preliminary evaluation of the Special Fund for Technical Assistance (FEAT), one project of the Agricultural Development Program (PDA) within the Agriculture, Livestock, and Food Ministry, funded by the United States International Development Agency (USAID).

The aim of FEAT was to privatize technical assistance channeled to poorer farmers to allow them to install irrigation systems and to diversify their production and make it more responsive to market conditions.

Louis Berger International Inc. (LBII), the company contracted for this preliminary evaluation, established that the population under study consisted of more than 100 groups and some 1300 farmers who were involved with the program in its two years of existence and a group of no fewer than twelve were to be included in this evaluation report. The evaluation would be based on structured informal interviews with the groups, member and non-member farmers, and the staff technicians. The entire evalution lasted approximately three months.

The evalution demostrated that the majority of the FEAT technicians came from the agricultural public sector and had become involved in the program as a means to improve their incomes and to continue their professional development.

In the case of the farmers, the majority turned out to be small scale agriculturalists who were owners of an average land extension of 5.48 cuerdas of 25 X 25 (one cuerda = .044 hectares), with access to irrigation. They joined the program hoping to increase their incomes.

The program was meant to cover the areas of agricultural production, administration, and commercialization. In practice the technicians have not always dealt with the administrative and commercial aspects. This is primarily because the technicians themselves were not sufficiently knowledgeable in these areas so they made productive activities their priority, leaving commericalization to the producers.

The FEAT proposed methodology for the program has changed in practice, especially in the area of honorarium payments to the technicians. The farmers and technicians agreed that payment should be based on a proportion of the benefits obtained by the farmer.

Generally the farmers were satisfied with the program results as their production has appreciably increased as have their incomes. The principal limitation has been in the commercialization of their products which depends on export companies whose standards have had negative effects on the farmers.

The success of the program is obvious in the fact that none of the groups interviewed have failed to pay the technicians, although they did not seem to know if in the following years they should increase the proportion of the technician's honorarium, given that the program's input is diminishing.

The farmer groups expressed interest in continuing with the program based on the results they get. Currently, their improved incomes have translated into better nutrition, and purchasing commercial products and other benefits, an important aspect of which is that many in the group have not had to go to the southern coast for the export crop harvests which had been a traditional survival strategy.

In terms of the program's negative aspects, the diversification in production towards non-traditional crops has brought changes in agricultural technologies, including an increase in the use of agrochemicals and more intensive soil use, which may have long term negative effects on the population. FEAT technicians have not always been concerned with evaluating this situation and recommending less problematic technologies.

It is also important to point out that the presence of FEAT technicians has created conflict with the public sector agricultural technicians. Far from coordinating their activities, they have been quite divided with the consequent negative effects.

Attempts to analyze the general impact of the program have been limited by the lack of general information regarding the program's coverage from its beginning to the present.

Executive Summary

1. Purpose of project. The Highlands Agricultural Development Project was begun in 1983 as an agricultural diversification project designed to raise small farmer incomes and increase the flow of hard currency into the country by raising and exporting non-traditional agricultural products. One component included support for small irrigation systems for groups of farmers to allow them to more fully utilize lands, especially in the dry season. The Project, which has undergone major revisions and changes in methodologies and strategies, is currently in its 10th and final year.

2. Purpose and methodology of evaluation. The purpose of the survey portion of the evaluation was primarily to assess change in the status of small irrigation beneficiaries, principally regarding agricultural practices, value of agricultural production, and level of living. The evaluation focuses on three time periods: before participation in the Project, the 1990 crop year when a baseline survey was carried out, and the 1992 crop year, for which the baseline survey was repeated. The period previous to 1990 was surveyed using retrospective questions in the 1992 survey.

The survey universe consists of 421 beneficiaries of 65 small irrigation systems selected at random from a total of 10,111 beneficiaries in 347 systems in all seven agricultural Regions in Guatemala. These systems included 166 beneficiaries which participated in the priority technical assistance program; the rest did not. In addition, 77 surveys of beneficiaries of the FEAT program were carried out. The survey data thus allow for comparisons between pre-Project, 1990, and 1992; between FEAT and non-FEAT; and between priority and non-priority.

3. Findings and conclusions. Overall, change in the status of small irrigation system beneficiaries has been positive but not dramatic.

a. Agricultural production value.

- Project participants have experienced an overall increase in the value of its agricultural production. Nearly two-thirds of the farmers had a positive increase in agricultural production value in absolute terms, 53.4% had a positive rate of change, and the median increase in value was 44.7%, well over the 14.2% inflation rate.

- The increase in agricultural production value was achieved through increased value of production in commercial crops, not subsistence crops, which remained basically static. Thus, the Project had a positive effect in its principal area of focus: commercial crops.

- There is a clear relationship between the amount of land cultivated and the total value of agricultural production, but only as regards land owned by the farmer, not rented land. The implication is that farmers really do not make money on their rented land, just on their own land.

- Farmers with more than six years of participation in the program have done less well than others, possibly because the groups formed earliest in the project were located in regions with less potential, particularly Regions I (Guatemala) and VII (Huehuetenango-Quiché), and they generally own less land today.

- While the total amount of land cultivated by the average farmer did not increase from 1990 to 1992, the amount of land under irrigation did increase by 14%. This increase appears to be clearly the result of the fact that more farmers were actually using the irrigation system, as the percentage of farmers not using the irrigation system for one reason or another dropped from 26% in 1990 to 15% in 1992.

b. Improved agricultural practices

- The project had a net positive effect on agricultural practices, but changes occurred primarily among farmers who participated in the project for more than three years. In addition, farmers usually adopted no more than one improved practice out of 10 possible practices.

- Change toward improved practices favored soil conservation over other practices. Four of the 10 practices involved soil conservation, two involved fertilization, three involved pesticides, and the last involved improved seed. Two of the four soil conservation practices were the ones most notably affected by the project and among those least likely to be attributable to other factors.

- Improved practices can be attributed to public sector technical assistance. The four soil conservation practices plus natural fertilizer are nearly always attributable to public sector technical assistance, and three of these five show notable positive change during the life of the project. The use of terracing increases from 13.9% for those with three years or less in the project to nearly 50% for those with more than seven years.

c. Level of living

- While not statistically significant in relation to number of years in the project, the trend of change is favorable: 77.9% of the 421 homes experienced at least one positive change in the home. Changes were mainly in services (latrine, domestic water source, electricity - 72%) and less in house construction characteristics (walls, roof, floor - 23%).

- In services, the greatest change occurred in the existence of a latrine (28.7% before Project, 84.8% after), an important change because of the three services, it is most dependent on individual decision and least likely to be tied to a community-wide project.

- While indoor piped water and electricity might seem independent of individual farmer income and dependent on community collaboration, electrification projects now include a community (and therefore an individual) contribution, so increased income from the Project may play a role in making such a contribution possible.

- Regarding improved housing, changes have been few: floors - 16%, walls - 11%, and roofs - 7%. Most changes have probably involved floors, because a new floor can be installed without additional structural changes.

- Regarding the number of household items, such as radios, television, sewing machines, refrigerators, gas stoves, irons, closets, vehicles, and bicycles, there is an average increase of one item per household, though this increase is not related statistically to number of years of participation.

IMPACT EVALUATION:

CASE STUDIES

Document prepared for:

Louis Berger International Inc.

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August, 1993

TABLE OF CONTENTS

Executive Summary

The case studies of the Agricultural Development Program (PDA) were carried out by a team of experts from Prodesarrollo under contract with the firm Louis Berger International Inc. This document should not be considered as an isolated product, but as complementary to other studies (survey of beneficiaries, institutional analysis, study of the results on a national level).

The emphasis of our work was on evaluating, from a qualitative perspective, the expected and unexpected impacts from the point of view of the beneficiaries of the various small irrigation systems. The basic technique of the study consisted of in-depth interviews, complemented with the observation and group discussions. The central unit of analysis was the irrigation system and, complementarily, the home.

It is necessary to emphasize the contrast between the group of systems visited in the west with those in the east. The western systems had as common denominators following: They are formed by beneficiaries, mostly Mayan, in communities where Protestant presence is significant, even where the Catholic sector is bigger. The plots of land owned by the beneficiaries are small, but of good quality. The logic of the commercial and export market has been learned only recently, and the peoples' lives are more rooted in subsistence. The communities visited in the east-center-north are formed by *ladino* beneficiaries, are almost exclusively Catholic, with generally larger land properties but of inferior quality, and with more of an understanding of the market logic (except the Mayan communities from El Tempisque in San Miguel Chicaj and partially Chibul, in Cubulco, both belonging to the province of Baja Verapaz).

The most important result of the study, from the viewpoint of the systems' beneficiaries, consists in a positive valuation of the small irrigations. Even where there are important negative impacts (such as the deterioration of the environment and social and intercommunity differentiation), the positive impacts (such as the increase of the agricultural production and income, the decrease of migration, job creation, etc.), seem to justify the activities undertaken during many years by the Agricultural Development Program (PDA).

There is a global appreciation originated from the interviewee's opinion that makes us think in a positive impact: bigger production, income, job creation, decrease of migration, and increased crop diversification. The expected results for the diverse stages of PDA do not seem to have been accomplished, with the exception of the increase in production and income, which increased in many cases as much as 50%. However, the unexpected

results regarding job creation and slowing of the rural migration, together with the decentralized regional development that were stimulated by the systems are important to emphasize.

The most important negative impact consists of the deterioration of the soil, small watersheds, and the environment as a consequence of inputs whose use was not totally sensible (especially pesticides), and whose consequences may be felt for some time. It would seem that there is not a clear consciousness of its effects.

Regarding the conclusions, the most important ones are the following:

1. The increase of income and the improved level of living of the beneficiaries.

2. Disappearance of the rural temporary migration flows between beneficiaries' homes and its slowing down between homes of its area of influence.

3. Generation of temporary rural work.

4. Slow rise in the educational level in beneficiaries of the systems' homes.

5. Economy and investment of the beneficiaries in lands.

6. Relative knowledge of the environmental impact and the appropriate use of the technological package among the beneficiaries.

7. Significant advances regarding the protection of the persons who use pesticides.

8. Little organized action oriented to marketing as an initiative organized by the beneficiaries.

9. Acceleration of the social intercommunity differentiation process.

The most important lessons are the following:

1. Perhaps the most important lesson is that this program should be repeated, with the pertinent adjustments. Although it may be that it shows many weaknesses, considering overall results, it is better than most of the projects of sustainable rural productive development.

2. It is obvious that, from the national perspective, the small irrigation projects are the most successful and the

type which should be done in the future. Here, problems are minimized and the results are better.

3. Despite the criticisms that occur during the process of diversification and introduction of new crops that are subject to market oscillations, the beneficiaries consider it a learning experience. This helps the beneficiaries to prepare themselves better for dealing with the logic of the market as opposed to subsistence.

4. It is important that the project implementers in the future evaluate the impact of a project that generates more participation of women and children in the irrigation projects. From our perspective, it tends to overload these social segments with work, exposes them to risks, causes them to ignore other activities which are important both for biological and social reproduction (among married women) as well as for the improvement of conditions through education (especially among children).

I. Introduction

The investigation that we present consists of case studies of the Agricultural Development Program. It was carried out by a group of experts from Prodesarrollo under contract with the firm Louis Berger International Inc. It should not be considered as an isolated product, but as complementary to other studies (survey of beneficiaries, institutional analysis, study of the results on a national level).

The emphasis of our work was based on evaluating -from a qualitative perspective- the expected and unexpected impacts from the point of view of the beneficiaries of the various small irrigation systems. The interview was the basic technique used in the study, complemented with observation and group discussions. Twenty irrigation systems distributed throughout the country were selected; these systems are the central unit of analysis with the home as secondary unit of analysis.

The document contains four principal sections. In the first one of them, the methodology is presented. Subsequently we describe briefly each one of the communities where irrigation systems are located. Then, the results are presented in the diverse subsections by topic. Finally, we present the conclusions and lessons learned that can be utilized in future projects.

II. Methodology and Study Strategy

The study was done between June 28th and July 30th 1993. The first week was dedicated to the selection of the team and the work material, selection of the irrigation systems, logistics, development of the interview guide (see Annex), field methodology, data organization sheets, and a draft of the structure of the work report.

The team consisted of Carlos Arriola (agricultural sociologist), Rossana Rodríguez (social worker), Patricia Romero (sociologist), and Guillermo Pedroni (social anthropologist, coordinator). Two work teams were formed as planned. The first, consisting of Rossana Rodríguez and Carlos Arriola, focused on the western highlands while the second, consisting of Patricia Romero and Guillermo Pedroni, focused on the center, the north, and the eastern parts of Guatemala.

The second and third weeks were dedicated to visiting the irrigation systems and carrying out the pertinent interviews. At the same time as the field work, data organization sheets were utilized and a sketch of the report was made. The last week was dedicated to writing the final report of the study.

Although we were guided with the terms of reference for the development of the study, we established the irrigation system and complementarily the home, as the central unit of analysis and the community as the contextual reference. As a consequence, we selected systems based on the regional distribution, type of system, size and estimated degree of success, using as a point of departure the visits made with the application of the survey, done previously. In this manner, we established a list of twenty-four irrigation systems: ten to be visited by each of the work teams and two substitutes (two FEAT systems were included). Thus, between July 5th and July 17th (one day per system and two to three of intermediate rest) the following systems were visited:

1. Quiajolá, Huehuetenango
2. Chichán, Río Blanco, Huehuetenango
3. Buxup, Jacaltenango, Huehuetenango
4. Concepción, Sololá
5. Duraznales, Concepción Chiquirichapa, Quetzaltenango
6. El Aguacate, Concepción Chiquirichapa, Quetzaltenango
7. Buena Vista, San Juan Ostuncalco, Quetzaltenango
8. Santa Rita, San Antonio Sacatepéquez, San Marcos
9. San Ramón, San Antonio Sacatepéquez, San Marcos
10. Ixcá, San Andrés Chápil, San Marcos
11. Saspán, San José La Arada, Chiquimula
12. El Jocotillo, Ipala, Chiquimula
13. El Suyate, Ipala, Chiquimula
14. Los Planes, San Juan Ermita, Chiquimula
15. El Tempisque, San Miguel Chicaj, Baja Verapaz
16. Chiul (Chibul), Cubulco, Baja Verapaz
17. Los Mixcos, Palencia, Guatemala
18. Río Frío, San José Pinula, Guatemala
19. Encino Gacho, El Progreso, Jutiapa
20. Las Pozas, Jutiapa, Jutiapa

Just as it was said before, the central unit of analysis was the irrigation system an complementarily the home. The case studies were carried out thinking in terms of the systems. If the homes would have been taken as case, it would have been necessary to increase the number of homes to obtain reliable results because of the variety of situations found in each system.

The interview was the central instrument used in carrying out the case studies. The guide was made up of two parts. The first part contains basic information on the system and the interviewee; the second part probes the basic themes that permitted us to establish the impact of the PDA in each of the cases. After an introduction to establish an adequate atmosphere for the interview and to contextualize the problem inside the community, the themes dealt with were the following: family economy, use of the agricultural work, participation of women in agricultural production, variations between types of irrigation, technical

assistance, handling of pesticides and pollution, and the expected and unexpected results of the project. In all cases, the questions in the second part were open, and responses were collected through taking notes and cassette recording. The components about women, especially those regarding their participation in agricultural work, were collected by the female members of the team.

The individual interview was complemented with group interviews and discussions (which in some cases tended to become focus groups), and interviews were also complemented by observation of the community, the irrigation system and the homes. The individual interviews were carried out before the group interviews. Although the selection of the interviewees was arbitrary, in all the cases we followed the same procedure: first, we identified the leaders, members of the irrigation committee board of management (in some cases it did not exist or performed a strictly formal role); the second step was to interview a prominent member of the board, an ordinary member, and a woman (preferably a beneficiary, if there were any). The group interviews carried out later were informal, done with the participation of all those who had the time to do so (usually those interviewed individually were also included in the group).

No significant problems were encountered while doing the interviews. On the contrary, the interviewees selected were quite willing to participate even though they were not paid for their time (in contrast to the survey, where interviewees were paid).

The data was organized on data organization sheets in which twenty-six themes, based on the terms of reference of the case studies, can be commented. There were two sets of data organization sheets, one for each field team.

The areas for each field team, plus the irrigation systems and the communities involved, were presented together to focus on a particular problem. This is especially important if we consider that the data are presented by themes and not by systems in order to get a certain degree of generality and contrast. The emphasis was in establishing changes and impact in each one of the proposed themes. The basic information used consisted of the information given by the surveyors involved in the base study, the preceding study by Prodesarrollo, and documents provided by Hugo Orellana of the evaluation effort about each of the stages of the Agricultural Development Program.

The presentation of the results appears by themes into which conclusions and lessons learned for the future are added. For these last sections we put all the emphasis on the positive and negative impacts, based on the terms of reference and on the expected results in the different stages of the PDA.

III. Regions and Irrigation Systems

Although the distribution of the work between both teams in the natural environments was based on a field strategy, here a comparative methodology viewpoint was also implemented. Western Guatemala contrasts with the center, the North and particularly the East.

The group of systems visited in the West have a common denominator: they are made up of beneficiaries, mostly Mayan, in communities where the Protestant presence is significant, even where the Catholic sector predominates; the properties are small, the quality of the land is good, and an understanding of commercial and export markets is recent.

On the other hand, the small irrigation systems visited in the other region are formed by *ladino* beneficiaries, these communities being almost exclusively Catholic with larger properties than in the west but with inferior quality of land, and the market understanding prevails over subsistence farming (except those from El Tempisque in San Miguel Chicaj and Chibul, in Cubulco, both belonging to the province of Baja Verapaz).

This is why the bigger generalizations and differences derive from this basic regional contrast. However, it is obvious that differences and contact points between systems exist, as will be seen from the following brief description of the communities and small irrigation systems.

IV. Description of the Communities and the Irrigation Systems.

A. Quiajolá, Huehuetenango

The irrigation system is located in the village Quiajolá, in the municipality of San Sebastián, department of Huehuetenango (Region VII). The system is quite big, uses sprinklers, is gravity fed, and has a superficial source (spring).

The village of Quiajolá is approximately four kilometers from the city of Huehuetenango. It is located at the foot of the mountain and is between the river Selegua and the highway to the Mexican border, going through La Mesilla. The village population is mostly Mayan of Mam ancestry; they make a living from agriculture and are economically poor. The people live in scattered houses at some distance from one another.

The most important crops are corn, beans coffee, tomato, broccoli, cauliflower and cabbage. The migration of laborers to the plantations in the south coast is quite common. The basic problem that the beneficiaries have to face lies in the difficulties found when irrigating the plots that are in the upper part of the system.

B. Chichán, Río Blanco, Huehuetenango

Chichán is an irrigation system located in the village Río Blanco Chiquito, in the municipality of Jacaltenango, in the department of Huehuetenango (Region VII). The system is of medium size, uses sprinklers, is gravity fed, and of superficial source.

The community is Mayan, Mam-speaking, with traditional catholics and with a certain presence of Protestant churches. The central activity is agriculture, complemented with handcrafts. The principal crops are garlic, beans, onion, tomato, cauliflower, broccoli, pepper, jalapeño chili, corn, and recently pony.

With the irrigation, the community cultivates garlic, onion, tomato, cauliflower, pepper and corn. The system is going through a series of problems as a result of the lack of an adequate pump. In consequence, there is not enough water to irrigate all the plots. This system has only had little success.

C. Buxup, Jacaltenango, Huehuetenango

This irrigation system is in the village of the same name, located in the municipality of Jacaltenango, in the department of

Huehuetenango (Region VII). The system is medium size, uses sprinklers, is gravity fed, and has a superficial source.

The community is quite big, with partially uneven land and basic services (education and health). Access is by a passable dirt road through Jacaltenango. The system receives a small support from DIGESA, which together with MINDES, are the only development organizations in the area. The people are mostly Mam-speaking Mayan. Catholicism is the prevailing religion, both traditional and charismatic.

In this community the basic economic activity is agriculture; the most important crops are corn, beans, chili, anise, peanuts, tomato, hibiscus flowers (for tea), and chipilín. With the irrigation system, the principal crops are beans, corn, peanuts, and tomato. The main problem that the system faces is the obstruction in the pipes. It cannot be considered a successful system (nor it is a failure) in which a relatively successful process of diversification can be observed.

D. Concepción, Sololá

This system is found near the municipality of Concepción, in the department of Sololá (Region VI). The system is located in a semi-mountainous area, with fertile soil. The irrigation system is quite big, uses sprinklers, is gravity fed, and of superficial source. The community population consists of 320 homes. The population is mostly Mayan of Cakchiquel origin, and is traditional Catholic.

The properties are small, where the people cultivate corn, beans, potato, onion, beet, broccoli, cabbage, carrot, green beans and peas. The irrigation system shows a high degree of agricultural diversification, with no problems in the irrigation system. The problem lies in the litigation that the people face because of the property of the water spring. The beneficiaries state that, if they lose the litigation, the system will surely disappear. If it were not for this problem, the system could be considered a successful one.

E. Duraznales, Concepción Chiquirichapa, Quetzaltenango

The system is located in the village Duraznales, the only one in the municipality of Concepción Chiquirichapa in the department of Quetzaltenango (Region VI). The small irrigation system uses sprinklers, and uses electricity to pump water from a well.

The village has around 1,600 inhabitants who speak the Mayan language called Mam. The area is mostly Mayan and has few basic

services. It is located in an area on medium altitude in an uneven land. The main activity is agriculture, the main crops being corn, potato, onion, carrots, beet and broccoli. The crops under irrigation are potato and broccoli. The principal problem that faces the beneficiaries is the cost of electric energy. Irrigation in this region can be considered only a modest success.

F. El Aguacate, Concepción Chiquirichapa, Quetzaltenango

This system is in the municipality of Concepción Chiquirichapa in the department of Quetzaltenango (Region VI). The irrigation system is medium size, uses sprinklers, and uses electricity to pump water from a well.

The community is located fourteen kilometers from Concepción Chiquirichapa. It is mountainous, uneven and of medium altitude. Its population is mostly Mayan (Mam). Even though Catholicism is the main religion, there are also numerous different Protestant churches.

Apart from agriculture, there are no important economic activities and handicrafts are almost nonexistent. The main crops are corn, beans, broccoli, onion, and cauliflower. The natural center of supply and market is the city of Quetzaltenango.

The irrigation system can be considered as successful and diversified. The principal problem lies, according to the beneficiaries, in the cost of the electric energy.

G. Buena Vista, San Juan Ostuncalco, Quetzaltenango

This small irrigation system is located in the hamlet of the same name, located two kilometers away from San Juan Ostuncalco, in the department of Quetzaltenango (Region VI). It is a small irrigation system, uses sprinklers, and uses electricity to pump water from a well. This municipality is mountainous, medium altitude and mountainous humid vegetation. It is mostly Mayan of Mam ancestry, mostly Catholic but with a significant presence of protestant churches.

Although the economic activity centers on local agriculture, another sector of the population works as wage earners in Quetzaltenango. Moreover, migrations to the coast are quite common.

The most common crops are corn, beans, potato, onion, brussels sprouts, carrots and peas. There are two markets of reference: one in San Juan Ostuncalco and the other one in Quetzaltenango.

This recently installed system has worked only during one month (February), because the natural rain cycle makes it unnecessary. Even so, the people do not know whether they will use it again in February next year because of the high cost of electricity.

H. Santa Rita, San Antonio Sacatepéquez, San Marcos

This small irrigation system is found in the village of Santa Rita, two kilometers away from San Antonio Sacatepéquez in the department of San Marcos (Region VI), by way of a dirt road passable all year long; San Antonio is nine kilometers away from San Marcos on an asphalt highway. The system is small, uses sprinklers, is gravity fed, and has a surface source (spring).

The topography of the municipality is mountainous, of medium altitude and its forest is mountain-tropical humid. Santa Rita is a ladinoized village, whose inhabitants stopped speaking the Mam language two or three generations ago. Catholics predominate despite the existence of numerous Protestant churches.

The economy is based on agriculture, raising cattle, goats, and sheep, and textile handcraft. The most important crops are corn, potato, Lima beans, cabbage, beet, carrots, cauliflower and acelga (chart/saltwort).

The basic problem the system beneficiaries face is water shortage, which does not allow the irrigation to reach all the land during the dry season. We should also mention that there is little diversification regarding crops.

I. San Ramón, San Antonio Sacatepéquez, San Marcos

The system is located in a small community with easy access to the San Antonio Sacatepéquez, in the province of San Marcos (Region VI). It is linked to San Antonio Sacatepéquez by a dirt road. The irrigation system is medium size (at present it has 14 beneficiaries), uses sprinklers, is gravity fed, and has a surface source (spring).

It is a small community on hilly land. The people are *new ladinos* (although with Mayan features), and Catholicism is the dominant religion. Services are few, although they do have piped drinking water. Agriculture is the main economic activity, and they harvest corn, beans, wheat, potato, cabbage, radish, carrots, onion, lettuce and peas. In the area under irrigation, people cultivate cabbage, carrots, beets, acelga, potato, cauliflower, broccoli, brussels sprouts and onion.

The beneficiaries' main problem lies in the shortage of water; they even face the need to use the water that the irrigation system generates for domestic consumption.

J. Ixcá, San Andrés Chápil, San Marcos

This small irrigation system is located in the village San Andrés Chápil, which belongs to the municipality of San Pedro Sacatepéquez in the province of San Marcos (Region VI). The system is uses sprinklers, is gravity fed, and has a surface water source.

It is found at a short distance away from San Andrés Chapil, with a dirt road joining both communities. The land is mostly level and the village is large. Even when Spanish is the principal language spoken in the region, (Mam is not spoken anymore) this village must be considered ethnically a Mayan community. More than the 50% of the people are Protestant, belonging to different churches. The rest of the population is Catholic.

In contrast with the rest of the communities visited, the main economic activity is industrial: Mayan-style clothing, shoes, tailoring, carpentry and masonry. The people also cultivate corn, beets, onion, cabbage, cauliflower, carrots, radishes and flowers. In the area under irrigation they cultivate potatoes, beets, onions, cabbage, cauliflower, carrots, radishes, flowers and corn. The system is quite successful, with no significant problems.

K. Saspán, San José La Arada, Chiquimula.

The village of Saspán has approximately seven hundred inhabitants and belongs to the municipality of San José La Arada in the province of Chiquimula (Region III). It has a small irrigation system that benefits five families.

The village is mainly *ladino*, although it is not a typical eastern village. Access is difficult over a five kilometer dirt road leading to the improved dirt road that joins Ipala with Chiquimula, making the transportation difficult to Chiquimula, the principal market. Their most important crops are corn, beans, chili and tomato. With the introduction of the irrigation system (using sprinklers, gravity fed, and with a surface water source), onion and loroco were added to the crops; there are also vegetable gardens for family consumption.

There is little technical assistance, although one of the beneficiaries is an agricultural representative of DIGESA in the community. The people practice a variety of methods of soil conservation. Undoubtedly, this system must be considered as one of the most successful ones.

L. El Jocotillo, Ipala, Chiquimula

This irrigation system is situated in a hamlet of the same name, belonging to the municipality of Ipala in the province of Chiquimula (Region III). It is joined to Ipala by a 10 km dirt road in fairly good shape. Both the community land and the irrigation system land is level and swampy. This system, which began operation the summer of 1992 is drip system, has an underground source (well), and uses electric energy.

The population is made up of nineteen families, of which eleven are beneficiaries of the system. All of them are wealthy *ladinos*, usually related to each other through kinship and marriage.

The priority crop is rice, and production is market oriented. The crops grown using irrigation are limited to tomato which because of market difficulties has become a negative experience.

At present the beneficiaries receive technical assistance from DIGESA. The situation is difficult for this system because of the failure of the tomato crop, their high debt with BANDESA, and the high cost of electricity.

M. El Suyate, Ipala, Chiquimula

This irrigation system is situated in a small hamlet of the same name near the municipality of Ipala in the province of Chiquimula (Region III). The road to El Suyate is in good condition and all 22 beneficiaries live in Ipala. The system began operation in 1990 with support from DIGESA. The irrigation system is uses sprinklers and electricity, and has an underground water source. The irrigated land is level.

The chief crops in the area are corn and beans, the latter grown primarily for market. From the beginning, the main crop for exportation on the land under irrigation has been okra.

The inhabitants of the community are *ladinos*, as in the rest of the municipality. The beneficiaries belong to a middle social level and some of them were not mainly farmers when they joined the small irrigation system.

The basic problem lies with the expenses for electric energy made by the beneficiaries to INDE, which will probably cause the system to be abandoned shortly. The high cost of energy prevents us from considering this a successful system, even though in past years the prospects were promising.

N. Los Planes, San Juan Ermita, Chiquimula

This is an irrigation system in Region III in the province of Chiquimula, municipality of San Juan Ermita. The system is situated in the village Los Planes, on the road that joins Vado Hondo with the border of El Florido. The village is situated on uneven land.

The community is *ladino* with approximately one hundred and fifty families dedicated the cultivation of corn, beans, onion and tomato. The irrigation system began in 1986 with support from DIGESA; at that time it was made up of twenty four beneficiaries. The system uses sprinklers, is gravity fed, and has a surface water source. At present it still has some support from DIGESA.

The small irrigation system took the place of the traditional rustic irrigation system. Since the introduction of the new system, the previous problem between beneficiaries of high and low areas was inverted. At present, the ones "above" are the ones who complain of the shortage of water, while the ones "below" have it in abundance. Despite this contrast and different technical problems, this system can be considered successful.

O. El Tempisque, San Miguel Chicaj, Baja Verapaz

This irrigation system is located in a village of the same name, which has approximately two hundred inhabitants, all of them Mayan (Quiché-Achí), and of the total, twenty five are beneficiaries of the system. El Tempisque is approximately twelve kilometers from the city of Salamá (Region VIII), connected by a dirt road in good conditions and passable all year long.

The community cultivates corn, beans, peanut and tomato. The irrigation system was installed in 1988 as a donation with the support from COGAAT and AID, in contrast to the rest of the systems visited. The system consists of a reservoir built in the river Salamá, from which the beneficiaries pump water to irrigate their plots with hoses.

The institutional support that the beneficiaries receive at present comes from DIGESA, one of the beneficiaries is the DIGESA agriculture representative. The main problem of the system is that sand gets into the reservoirs preventing their proper use. Difficulties regarding credit and marketing, added to the poverty in the region, explain why most of the beneficiaries farm for subsistence and consider the irrigation system a complementary activity. We also detected a high rate of desertion from the system. For these reasons, this system cannot be considered very successful.

P. Chiul (Chibul), Cubulco, Baja Verapaz

This is a small hamlet located in the municipality of Cubulco, province of Baja Verapaz (Region II). Even though Cubulco is essentially Mayan, 30% of the community is *ladino*, and 70% of the irrigation system beneficiaries are *ladino* population (it is common in the municipality that *ladinos* control water sources. Access to Cubulco is somewhat difficult, even though it is not further than three kilometers. Nevertheless, it must be noticed that this municipality is the one located the furthest away from the capital in relation to all the others of the province.

The irrigation system is a traditional one and in spite of having formed a committee and carried out negotiations with DIGESA for the installation, they have not been able to do so, not only because of the costs, but also because of certain conflicts in the control and use of the available sources.

This irrigation system, in the beneficiaries' opinion, wastes water. It shows a process of early diversification with the local market and in which the Mayans supply labor to the *ladino* beneficiaries of the system.

Q. Los Mixcos, Palencia, Guatemala

The irrigation system is found in a community of the same name in the municipality of Palencia, province of Guatemala (Region I). Access is good, and the community near Guatemala City, which is its natural market. The turnoff to Palencia is kilometer 20 on the highway to the Atlantic coast.

Los Mixcos is a thickly populated *ladino* village, where the irrigation system has operated since 1981 with more than seventy beneficiaries.

The irrigation system uses sprinklers, is gravity fed, and has a spring with a reservoir. The problems the system faces are caused by the mud that has accumulated in the reservoir and the shortage of water from February on, because the spring is also used by other nearby villages. Because of the water shortage, this cannot be considered a totally successful system.

R. Río Frío, San José Pinula, Guatemala

The irrigation system is in a small hamlet of the same name, located on the outskirts of the municipality of San José Pinula in the province of Guatemala (Region I). The access to the community is by a dirt road in good shape which is passable all year long. The system is small (only three beneficiaries) but it is connected

with the system of a nearby hamlet (El Colorado, with ten beneficiaries).

The inhabitants are *ladinos* who grow corn and beans on a minor scale, because of the uneven land, and who also produce cattle. The irrigation system combines sprinklers and hoses, is gravity fed, and has a surface source. It began in 1986 with support from DIGESA, though at present no institution provides services (neither in Río Frío nor in El Colorado).

Both in Río Frío and in El Colorado, the irrigation system has introduced new crops, like onion, tomato and vegetables, which have transformed the community in several ways. Both systems are successful.

S. Encino Gacho, El Progreso, Jutiapa

This small irrigation system is in a community of the same name, approximately six kilometers from the asphalted road that joins Jutiapa with Jalapa. It has approximately three hundred families, of which twenty two are beneficiaries of the system. This community belongs to the municipality of El Progreso in the department of Jutiapa (Region IV).

Populated by *ladinos*, this community is situated on level and fertile land, surrounded of other communities that also have irrigation systems, particularly the village Quebrada de Agua. The system began working in 1987 with technical support from DIGESA, although this technical assistance is now almost nonexistent.

The irrigation system uses sprinklers, is gravity fed, and has a surface source from nearby natural springs. From its beginning, it as an incentive in the production of traditional crops in the region. The irrigation system is at present a modest success.

T. Las Pozas, Jutiapa, Jutiapa

This small irrigation system is located in a village of the same name in the municipality of El Progreso, department of Jutiapa. It is two kilometers by dirt road from the asphalted highway that runs from Jutiapa to Asunción Mita. The village is made up of approximately four hundred *ladino* families, of which ten are beneficiaries. The chief crops are corn, beans, maicillo, tomato and onion. Of these, onion and tomato are the result of the process of diversification due to the small irrigation system.

This system, which began working in 1990, uses sprinklers and electricity, and has an underground source. Begun with support from DIGESA, this institution still works with the system, for one

of the group members is agriculture representative (although its technical assistance is minor).

Even though the beneficiaries state that the irrigation system has allowed them to produce in the dry seasons, this vear they plan to abandon the system because of the high costs of the electricity from INDE. For this reason, it must be considered as not successful.

V. Presentation of Results

A. The Home

The homes of the Mayan beneficiaries in the western part of the country, for various reasons, contrast with those of the East. The former are usually made up of extended families and have a larger number of members. This situation, added to their small areas of land, explains the difficulties they face to subsist as well as to confront all the other challenges regarding their plots, like diversification, marketing, etc.

In the center-north-east region, the average number of family members oscillates between five and seven people, and 85% of them are nuclear families with none but parents and their children. On the other hand, 53% of the families in the western region are multiple, with two or three families living under the same roof. Moreover, the 47% which are nuclear families have an average of seven to thirteen members.

It is unusual to find extended families in the East. When married, each child forms an independent home, based in most cases on inherited land. This characteristic of the *ladino* families contrasts with that of the Mayan families, in which the extended families are frequent. This style of Mayan home composition is the result of Mayan customs and to the extreme poverty conditions of the people in the rural West.

On the other hand, 93% of the beneficiaries in the west have not completed primary school, and the cultural characteristics of the interviewed population in the West allows one to understand the situation, regarding both biological and social reproduction, with the consequent demographic impact. The combination of extended families, associated with minute extensions of land explain the great difficulties and challenges the beneficiaries of the West have to face. In the East-Center-North a higher education level was found: 20% with complete primary education and even one interviewee with university studies.

B. Income

The income of the beneficiaries basically comes from agriculture, although not necessarily from the plots under irrigation, showing a modest process of diversification. 66% of the interviewees have only agriculture (and cattle raising on a small scale) as a source of income; this tendency is more accentuated in the West than the other regions of the country. Cattle raising, wage labor, work of their own or money received

from their children, are peripheral in Regions VI and VII of the West.

Among the non-agricultural income alternatives, a minority are dedicated to occasional or permanent wage labor and to working for themselves, for example, workers in State institutions (i.e. agriculture representatives from DIGESA), transporters (with their own vehicles), weaving, masonry, etc., which in a few cases constitutes their principal source of income. In some cases, cattle raising is a complementary source. Funds sent home by children were most common in the East.

Activities on the land are not just for subsistence or gain: they are also something that gives meaning to the lives if the beneficiaries:

> - We do not know any other work other than agriculture. We learned it from our fathers (parents) and we teach it to our children (José Gabriel López, Las Pozas).
>
> - Without land there is no life... (Francisco Moguel, Río Frío).

The diversification of the process of resources creation seems to be a need felt by most of the interviewees, although it does not mean abandoning agriculture. However, among the young people (especially the beneficiaries' children in the East-Center-North region), there is a tendency to abandon the agriculture activities for other "less tiring" ones.

Even though the case study does not allow us to establish with precision the role played by the crops under irrigation in the process of resources creation, we noticed evident contrasts from system to system from those who consider that their role in the system is essential to their incomes (Concepción, Río Blanco, Río Frío, Saspán) to those who consider their work more as a source of expenditures than of income (San Ramón, Buxup, Las Pozas). Nevertheless, the dominant feeling seems to be that agriculture under irrigation plays a complementary but significant role.

C. Domestic Expenses

The "gasto" (that is, the minimal family budget) is limited to salt, sugar, coffee, rice, pastas, etc., and among the beneficiaries it has not suffered significant variations as a result of the introduction of irrigation. Non-essential expenditures and investments also do not seem to be important either when comparing the patterns of expenses before and after the introduction of small irrigation systems. The exception regarding

investment and economy is the purchase of land in successful systems.

The minimal family budget seems to be constant, despite oscillations registered in income. Consumption patterns are stable. Changes are found mostly among young people than the systems' beneficiaries. Where the systems are bigger, there is a tendency to purchase in the nearby towns with better prices and bigger purchases rather than in the community store. Some beneficiaries mentioned that the quality of vegetables has improved and also that they save money when production makes it possible. This means that their land covers, in some way, their nourishment needs.

- It helps to have fresh vegetables. (Mr. Gabriel Montejo: Buxup I, Jacaltenango).

- What grows, we plant; why buy if we have land and irrigation? (Eduviges Orozco: Ixcá I).

We should point out that meat consumption has not varied, usually being once a week. Only in one case it was mentioned that it had changed: before irrigation they had meat just once or twice a month (Río Blanco Chiquito). Even though irrigation has contributed or benefitted farmers economically, toward family support, there have been no real changes regarding the customs or habits in diet.

Regarding the quantity of products, approximately 50% of the interviewees purchase more, but adduce this phenomenon to the growing of the family. A minority stated that the reason for this is because there is a little more money (Río Blanco Chiquito, Los Mixcos and Saspán).

The impact caused on luxury items and investments was not significant, as more than 60% had none. Saspán is one exception, where one beneficiary told us that irrigation generated income made it possible for him to buy a pick up truck last year. Investments in housing were few with the exception of El Suyate.

Whenever beneficiaries made important amounts of money, they invest in land; this happened in the 30% of the cases. This is usually in response to the desire to provide an inheritance for their children than to an interest in improving economy.

The investment in technological packages for crops, on the other hand, is not important. The small and medium farmer beneficiary invests in technology only when he receives credit or when agricultural exporters supply the inputs. In this aspect, investment and risk seem to be absent.

Some beneficiaries mentioned that expenditures in transportation to marketing centers was significant. One type of investment pointed out by beneficiaries was the education of their children (35% mentioned it). As one interviewee said:

> -The children studied, that's where I invested (Eduviges Orozco: Ixcá I).

D. Plots: Tenancy and Crops

The are of the crops under irrigation showed an outstanding contrast between the two regions. While in the West the plots are only a few cuerdas (0.04 hectares), in the East-Center-North these are measured by manzanas (0.7 hectares). However, this contrast is mitigated by the higher quality of lands in the West and a shortage of water in the systems of the East-Center-North. On the other hand, the interest and dedication put in the plot under irrigation seems to be more than among farmers who do not have the system and also more than in non-agricultural alternatives.

100% of the farmers interviewed farm lands both with and without irrigation, but most of the land is situated in areas without irrigation. In the West, irrigation is at present making the production of these crops possible: potato, broccoli, beans, peanuts, tomato, corn, beet, garlic, onion, cauliflower, pepper, carrots, cabbage and brussels sprouts. Meanwhile, in the East-Center-North the main crops are corn, beans, tomato, onion, okra and pepper.

As for tenancy, 100% are owners of the land they work, but it must be mentioned that three interviewees rent land. One rents 25 cuerdas; another rents 75 cuerdas in the southwest of the country for Q.500 for the whole plot, on which corn is cultivated.

To have a better idea of land tenancy in the communities with irrigation systems, we present the following statistics: of the interviewees, 53% own 1 to 10 cuerdas of land without irrigation; 30% own 11 to 20 cuerdas; 13.3% of farmers who own land have it all under irrigation, usually from 2 to 7.5 cuerdas, although one farmer owns 25 cuerdas and has them all under irrigation in Buxup I.

As for the plots with irrigation in the West, the information is as follows: 40% of the farmers own 4 to 6 cuerdas under irrigation; 23.3% own 3 cuerdas; 16% own 2 cuerdas; 13.3% own 7 to 10 cuerdas; 3.3% own 1 cuerda. In the East-Center-North the numbers are different, as 45% of the owners between one and two manzanas under irrigation, but more of a water shortage, which usually prevents them from irrigating all the land.

The difficulties in estimate quantitatively the work done by the beneficiary on his plots (and particularly in the area under irrigation) are well known. From a qualitative perspective, it is even more difficult. Even so, we can mention about the beneficiary's "interest, dedication and worry". Compared to the plots without irrigation and other non-agricultural activities, the plot under irrigation is where beneficiaries put most dedication and interest. This seems to be in response to: a) their self-identity as farmers; b) the few non-agricultural alternatives; and c) the nonexistence of other important activities in the dry season, which allows them to concentrate all their efforts on the plot. This is essential, for there are no other distractions. Moreover, the farmer that uses the irrigation system obtains prestige: while the beneficiaries produce, the non-beneficiaries must wait for the next rainy season (in a later paragraph we comment on the process of social differentiation caused by the irrigation system). Finally, it is necessary to point out that this attitude appraisal of "interest, dedication and concern" does not necessarily mean that the plot under irrigation is the central source of income (see previous paragraph on the subject).

E. Family Agriculture Labor

In general, we must point out that in most cases there is some degree of family participation in agriculture labor, with or without irrigation. The interviewees tended to hide and/or underestimate the incorporated family labor. Contrast exists between the West and the East-Center-North: family participation in the West is much more important. Also, strong contrasts were seen in the overall family participation, both in crops and in tasks; in this sense, the vegetable garden as a crop and the harvest as a task involved the highest family participation. Finally, it is necessary to observe that increased diversification created by the small irrigation systems led to an increase in family labor.

Participation in family agriculture labor is as follows: with 30% of the interviewees, wives and children work; with 30% only children; with 13% only wives; with 13% other relatives and with 13% no-one. Family labor participation in the East-Center-North region is lower. This is the result of the question of prestige, better economic conditions, and the prevalence of a market orientation. Furthermore, we suppose there was a certain degree of hiding in the region: it is difficult for an eastern farmer to accept that his family works on the farm because by saying so, he would be accepting indirectly that he is poor (not so much before the researcher, but before his community).

Most of the family members who participate in agriculture, work on all plots both with and without irrigation. While the

total amount of time they spend on agricultural tasks is little, this time is an important contribution.

Family members spend little time on agricultural tasks because they have other things to do, such as studies or other activities in the case of children.

- On Saturdays, when they don't have classes, my children work, but they only dedicate a few hours. (Mr. Eduardo Mendoza: Buxup I);

- When they're not studying, my children help me. (Natalio Orozco: Ixcá I);

In the wives' case, they dedicate time to house work:

- (She helps) from time to time but she doesn't have too much time, she has a lot to do at home, she has the house work. (Mr. Oscar Cabrera: Duraznales).

The aforementioned shows that, with only a few exceptions, the beneficiary is the only one directly involved in farming (especially in the plots under irrigation).

30% of the cases where only children participate, the economically active population is made up of the wives, who carry out domestic tasks, and this by decision of the husband. There were only two cases (Ixcá I) in which the wives do not participate in agriculture because they were older women (60-95 years old).

It is possible to observe that family participation is a relevant activity, and where children help even while still attending school, it is a way for them to begin "inheriting" their life's work which at a later date will be their means of subsistence.

- As my father taught me how to work, I also teach my children, so that they will know how to take care of themselves. (Leonel Orozco: Ixcá I).

The above means that even though formal education is recognized as valuable, in some cases it is not considered as the most decisive educational experience for future development of the beneficiaries' children

These family labor relations are linked in a practical way with avoiding having to pay for labor. Even though paid labor is contracted, family participation means that less money will have to be invested in paid labor. As one interviewee said:

- In the peanut harvest, my children help me, so I don't have to pay one or two days of labor (Gabriel Montejo: Buxup I).

Thus, children represent an economic value in the agricultural production process.

Finally, it is necessary to point out that, as mentioned above, the introduction of irrigation brought with it agricultural diversification, and this has meant the need to incorporate more labor into the process. Thus, family agricultural labor has increased although not excessively, even when these activities can be considered more intensive, since family labor is concentrated in the dry season when other agricultural activities are at a minimum.

wrong; plowing by hand & planting are the 2 most time consuming activities for men!

F. Woman and Agriculture Work

The introduction of irrigation systems with the consequent crop diversification has intensified the participation of women in agriculture labor. This phenomenon is more notable in the West than in the East-Center-North (especially in the East and Center). The greater participation of women in the West is caused by conditions of extreme poverty and by the predominance of vegetable gardens, which require more work in certain tasks. From a gender point of view, this situation does not bring a positive impact, because it forces women to add this activity to the ones they traditionally carry out.

It has been observed that rural woman traditionally carry out work that directly or indirectly helps in the family budget (i.e. taking care of animals, carrying wood and water for family consumption, etc.) and women also help in agriculture because of the role she plays in the family support. To these activities must be added those linked to biological and social reproduction (bearing children, early education, taking care of the home, cooking, etc.). The subordinated role of women is well known and was clearly visible in visits to the irrigation systems.

Women carry out the following agricultural activities: planting, weeding, harvesting, irrigation, and composting, tasks which men carry out as well, or which are carried out by paid labor.

- The women almost always participate in the harvest (Andrés Vicente Mendoza: Río Blanco Chiquito)

These tasks represent an added burden for women (mothers and daughters), since the situation is not shared by men in the sense that they also carry out tasks and responsibilities in the home and contribute with their labor in this area.

There is some consideration concerning the tasks carried cut by women, since they are not permitted to do the following: land preparation, fumigation, and transplanting. According to the beneficiaries, these are hard and delicate tasks which might hurt them physically.

In the West, in all of the communities investigated women participate in agriculture from an early age. In the East, just 28% of women participate. 70% of farmers said that girls began working in agricultural activities at the age of 10-12, usually in the planting, weeding, and harvesting, although less in planting.

- They help their father. Very few help, because they go to school. (Gaspar Vicente Velásquez: Río Blanco Chiquito)

- They are given easy tasks to do (Oscar Cabrera: Duraznales).

In this sense, young girls are denied the opportunity to learn other tasks, abilities and knowledge that could contribute to higher expectations of development, but this possibility simply does not occur to the farmer because on the one hand, rural communities have few service institutions to help with this development, and on the other, their incomes are not usually enough to allow them to invest in these kind of opportunities.

As for most older women, single or married, they too participate in agriculture, doing the same activities as the girls and also other things as fertilizing, fumigating, transplanting, and hoeing, and in some cases land preparation: in short, all farm activities. Even though fumigation could seem unusual, 26% of the interviewees said that it was normal for them to do so.

- Women do what men do, although now the woman has her place, she has her house work. (Mr.Oscar Cabrera: Duraznales).

Another activity which is indirectly associated with farm work is the sales of the products in the market and the buying and selling of agriculture products in general.

With the irrigation systems, women's participation in agriculture labor has increased, according to 53% of the interviewees; production diversification means they need to work harder and longer.

- Yes, because we now see there is more work, so the wife helps her husband more. (Andrés Vicente Mendoza: Río Blanco Chiquito).

> - Nowadays, on the other hand, there is more work for the woman because there is more production. (Gabriel Montejo: Buxup I).

In two communities with irrigation there were no changes in the activities the woman did in agriculture (Concepción, Sololá, Duraznales and Concepción Chiquirichapa), except regarding time, in that women now help in a task that has to be carried out in one day (for example, fertilization must be done uniformly). Therefore, women have to become involved even more in agriculture, having to re-organize her house work. This reaffirms what was said above about the extra work: unlike agriculture labor, house work is not shared equally between men and women.

In the irrigation of San Ramón, as a result of the introduction of the irrigation system, some participate in family vegetable gardens, which is a program of DIGESA.

> - Now they know how to make family vegetable gardens. (Filomeno de León: San Ramón).

In the East-Center-North, the participation of women is less. This is related both to the kind of crops and to the cultural pattern, in which the woman's place is in the kitchen. The removal of women from agricultural labor is a symbol of prestige and power, based on the typical eastern *machismo* concept. However, although women's participation is notably less, we detected a continuous hiding of the existence of this work with the male informants. In El Jocotillo, only the female researcher could detect, talking with the women, that women also participate in the work in the plots and under a certain pressure, while the male researcher did not obtain an affirmative answer from the beneficiaries despite his insistence.

G. Migration and Wage Labor

Even when migration and wage labor form two apparently autonomous themes, their interaction brings to light a positive impact of the project: while the beneficiary and his family have stopped migrating in the dry season, his neighbors in the same community or nearby have found wage labor in the plots under irrigation, therefore decreasing the migration flow and stimulating regional development.

At present, migration has disappeared in the families of the irrigation system beneficiaries. Even though in many cases this tendency is related to the irrigation, it is not necessarily a result of these projects, for the dynamic of the farmer's life has continued to be based on their own income creating activities (weaving, wage labor, agriculture, etc.).

- We are all dedicated to our own work. (Oscar Cabrera: Duraznales);

- I never had the need to leave Ipala. (don Jorge, El Suyate).

However, the irrigation projects are giving the farmer a certain economic stability and are contributing to the enrichment and organization of their agriculture activities, although not with a degree of efficiency or technology that is particularly high.

In the East-Center-North region, beneficiary migration tends to be toward Guatemala City. Moreover, in this same region it was stated that hired laborers are not usually from the same community, but rather from other poorer and sometimes Mayan neighboring communities (Los Planes, Río Frío, El Jocotillo). In the irrigation systems of Las Pozas and Chibul, migration was mentioned, especially among young people.

In relation to labor hiring, 70% of the interviewees hire one to four laborers, whose time working varies according the importance and needs of the crop.

- The irrigation needs to be done quickly, that is why I hire people, so that we may finish quickly. (Julián Méndez: Río Blanco Chiquitio).

In eastern regions such as El Suyate and Los Planes, there are beneficiaries who hire up to ten laborers during several weeks for the tasks that require the most manual labor. In general, contracts last three to six days, depending on the economic resources of the farmer, the area to be worked, the tasks required, etc. Among the poorest people, however, there are who hire no additional labor.

- We do not hire laborers because we don't have money to pay them. (Eduviges Orozco: Ixcá I).

Generally, the form of payment is by the day and in cash, from Q.7 to Q.15 per day. Most of the people hire laborers for all their plots with and without irrigation. In the East-Center-North, daily wages are from Q.13 to Q.20.

The tasks they have to do are: land preparation, planting, weeding, harvesting and fumigation. No hiring of women was registered in the East-Center-North.

- When women are hired, they only weed and harvest, they don't carry the product. They are paid Q.7.00. (Mr. Leonardo Cabrera: Duraznales).

H. Irrigation Systems: Types, Problems, Costs, Maintenance and Organization

The main type of system uses sprinklers, gravity fed, and has a surface source of water, usually a spring. The essential problems, which are present in 80% of the systems visited, are the following: shortage of water (either during the last of the dry season or because it is impossible to irrigate all plots under the irrigation system), pipe obstruction, and the costs of electric energy in the systems that require it (undoubtedly the most serious problem). In some cases the interviewees mentioned as problems technical calculation errors between the available source and the area to be irrigated, or problems in the source at the end of the dry season. The attitude beneficiaries have about the systems is positive, despite the problems and especially among those who have surface water sources.

The access to credit is mostly associated with the debt cancellation, particularly from BANDESA. Maintenance does not seem to be a problem, regardless of whether someone responsible is hired or in those systems in which the initiative is organized by the beneficiaries. Formal organization is generally present in the form of an irrigation committee, but the making of decisions is usually informal, especially in the small systems. Women, even though they may be beneficiaries, are excluded from decision making and participation in general. No external management was observed.

In the West, 100% of the irrigation systems work using sprinklers. In the East-Center-North, sprinklers are used by 80%. The time the systems have been installed and functioning ranges from three to 15 years in the West and from two to twelve years in the East-Center-North region. 50% of the systems have been working for seven to 15 years (Santa Rita, San Ramón, Quiajolá, Buxup I, Ixcá I), and the other 50% of the systems have been working for two to three years (Duraznales, Concepción, Río Blanco Chiquito, El Aguacate and Buena Vista, which has been working for five months). In the East-Center-North region, 50% of the systems have been working two to three years (El Jocotillo, Las Pozas, El Suyate) and the other 50% five to 12 years (Saspán, Los Mixcos, El Tempisque, Encino Gacho, Río Frío).

In both areas 70% of the water source is surface water (it usually comes from water springs) and its energy source is gravity. In the West, the remaining irrigation systems (30%) are have an underground source and their source of energy is electricity; two of them have been in operation two years and the other one approximately 5 months. In the East-Center-North region, the remaining systems (30%), have the same characteristics. These conditions allow us to compare the age of the systems, and also to understand that the type of system has been determined by the availability of water in the communities.

The most recent systems are those with an underground source. This may be an indication of the difficulty of finding new surface sources, which can be associated to the deterioration of the environment and the over cutting of trees, which naturally affects the natural water sources and which are harmful to beneficiaries of underground source systems, because of the high costs of investment to tap underground water.

One of the contrasts found between both regions is between the potential of underground and surface sources of water. The underground system's potential is greater in the West as the number of beneficiaries is usually from 60 to 70, while in the superficial source systems the number of beneficiaries is from 14 to 30. In the East-Center-North region the number of beneficiaries of underground source systems is from ten to fifteen, while in the surface source systems the number of beneficiaries is from twelve to twenty-two.

As for problems in the irrigation systems, the one that affects the most when there is an underground water source is the high cost of electric energy. For example, in the irrigation systems of El Suyate and Las Pozas (where the system uses sprinklers), beneficiaries have had to ask for the disconnection of the system because of the high costs. In El Jocotillo, they have a debt of Q.1400 per manzana (there are some beneficiaries who own up to three manzanas). In the West, people say:

> - Before, we used to pay Q.8.00 per cuerda, now it is Q.50.00; sometimes we pay from Q.12000 to Q.18000 monthly. I think it isn't fair for the poor peasants. (Marceliano López. Duraznales).
>
> - We have an accumulated debt for more than Q.50000; we cannot continue operating. (don Esteban, Las Pozas).

This increases the crop production costs, which are not recuperated in the market, which is characterized by changes of prices according to the supply and demand.

> - When it stops raining, some say the irrigation project should be canceled, the beneficiaries noticed that money in the project didn't produce profit, because of the high cost of electricity. (Leonardo Cabrera: Duraznales)
>
> - They are forcing the peasants very much. Do you know why? Because they are not prepared. The government has forgotten the farmer. The community of Duraznales recently planted 1000 cuerdas of broccoli in land rented from owners in Xela (Quetzaltenango); with agricultural labor we see we create work for the other people [referring to enterprises like INAPSA, VERDUFLEX and ALCOSA]. (Oscar Cabrera: Duraznales).

In the superficial source systems, the main problems are pipe obstructions (people throw objects into the holding tank which causes the pipes to break or the natural accumulation of earth and mud) and shortage of water (this also happens in the underground source systems), especially during the dry season.

- We would be better, but the water source is drying out; we found another source but we don't have the resources to tap it. (Eduviges Orozco: Ixcá I);

- From February onwards, we cannot irrigate because we haven't enough water. (don Francisco, Los Mixcos).

Some beneficiaries (in El Jocotillo and Los Mixcos, for example) stated that the technicians did not carry out adequate studies to calculate the water necessary for the amount of land. This appears to have occurred because of the rush to install the systems, the fact that funds happened to be available at the time, plus the lack of skill of the technicians who installed the systems which has caused inequities between the water source and the area of land to be irrigated.

Even though the systems have their limitations, two of them (El Aguacate and San Ramón) benefit the farm families with water for family consumption with the rationalization:

- We provide water to new families for their own consumption at home. (Filomeno de León: San Ramón).

The solutions to the different problems in the irrigation systems is determined by the nature of the problem. Thus for electric energy, it is essential for the farmers to pay the bills even though they are hurt financially. As for the pipes and water shortage, they have planned to take turns, to take better care of the holding tank, collect economic resource, but these solutions have not brought them positive results.

- During whole days we have to go and take care of the tank, but this hurts because we lose a whole work day (Gabriel Montejo: Buxup I).

With regard to whether the systems which are working are the worth while, 90% of the interviewees said it was. 60% of them said the reasons were the following: it allows them to save time, they count on the water; it is modern; and it irrigates uneven or hilly plots. The remaining 30% didn't know of any other system, so they couldn't compare. In one case, they said they would prefer a gravity fed system:

- If it were a system by gravity, there would be more benefits. (Leonardo Cabrera: Duraznales).

10% of the interviewees didn't give their opinion, because they still do not have experience enough with production parameters from the irrigation system, as in Buena Vista.

Most of the interviewees are optimistic. Even when the problems difficult, they generally consider them solvable. With very few exceptions, the general feeling was that the irrigation system does not bring enough disadvantages to eliminate it. Even when these attitudes are not optimistic, they express a positive impact from the beneficiary point of view.

Although we could suppose that a marked difference exists in the costs of the surface and underground source irrigation systems, the information shows that the costs are similar, except some which have been working eleven to seventeen years (Quiajolá and Buxup I). However, the agriculturist have received credit assistance from BANDESA and technical assistance from DIGESA, on how to carry out small irrigation projects, which helps facilitate their participation. The irrigation systems which are economically stable are: Quiajolá, Santa Rita, San Ramón, Saspán, Los Planes e Ixcá I, which represent 40% of the interviewees. The other 60% are still behind on payments.

As for interest, most of the interviewees think it was low in the past, but now interest is high in any financial transaction. Most of the payments have been done at the BANDESA office located in the departmental or municipal capital (which in some cases were referred to as BANDESA rural outlets).

An interesting impact to comment is the relation between the cancellation of the systems' debt and the success fulfilled with the help of credit (particularly of BANDESA). In this sense, it is clear that those who have paid for the system have relatively easy access to credit at this bank, but where the system is still in debt, credit alternatives are very limited because private banks do not work with this type of producers and the loan shark loans is available for only a few (in El Jocotillo two cases were mentioned).

Irrigation system maintenance is sometimes covered by the beneficiaries themselves and sometimes a person is hired. In 50% of the cases in the West and in 20% in the East-Center-North (which are mostly of underground source), a person is hired, usually paid between Q.250.00 and Q.300.00 monthly, and for electricity they pay between Q.30 and Q.50 monthly per cuerda (at present, Buena Vista has made no payments). It is seen that the complexity of these systems requires better control in their maintenance, which implies a larger investment by beneficiaries.

In the rest of irrigation systems the farmers have no electric energy or maintenance personnel costs, because they organize

themselves to work on repairs and purchase the materials, resulting in very low operation costs. These systems are probably the most profitable, because of the low costs in maintenance investment.

Irrigation systems administration presents similar characteristics in all the cases studied. Without exception, the irrigation committee boards of management are made up of the associates and is rotating, changing a maximum of every 2.5 years and minimum of one year, giving all the associates the opportunity to be a member of the board of management. Only in one case, the board could be for life, and that is when "no one wants to be a member of the board because it means more work" (Eduviges López: Ixcá I). Another common element is acceptance of how the board has functioned; excepting one case (some beneficiaries of Los Planes), everyone state they were satisfied with them.

Even so, as an organization the irrigation system has some serious weaknesses, for the irrigation problems and needs are cared for only partially. In all cases, the board of management's basic worry is the good functioning of the irrigation system installations. Concern for marketing, production, technical assistance, credit, etc., are not a part of their work. Only in one case (Buxup I), the board orients production through conversations with the beneficiaries, and what to grow is suggested.

It must be mentioned that in some systems, the presence of the organization seems to respond to a formal requirement of the donor or loan institutions and not to an initiative organized by the beneficiaries. This phenomenon was especially notable in the small systems (for example Río Frío or Saspán). In many cases, when we asked a board of management member what his particular role was, he had to stop and think or ask a fellow member. Another important aspect is the absence of women within the structures of the irrigation committees. They are not taken into consideration for the meetings organized by the beneficiaries, even when there are women beneficiaries.

There were no indications of outside interference found in any of the systems. The decisions on irrigation are in some cases, decided by the board of management at meetings and in other cases through informal conversations.

A contractual relation with enterprises which buy certain products is quite common. In 80% of the irrigation systems, farmers contract to produce a certain crop for exporters, such as INAPSA, VERDUFLEX, ALIANZA and ALCOSA. The beneficiary's decision is voluntary and it does not mean that all the irrigation beneficiaries have to all enter into such a contract.

I. Technical Assistance: Institutions and Coordination

Public sector technical assistance is limited, intermittent and inefficient. The most evident presence is from DIGESA. There were no NGO's registered in any of the systems. The assistance from FEAT is considered superior. Likewise, the technical assistance given by the agroexport companies is evident. The interinstitutional coordination, both between the public sector and private enterprise and between various public sector institutions is nonexistent.

Technical assistance is a vital element in the development of irrigation systems, and it has clear impact in spite of being rather weak. The problem begins with the institutional presence of the agriculture public sector in the places where the irrigation systems are located. In only one system (Concepción) was the presence of public sector institutions found to be active and efficient (DIGESA, DIGESEPE, DIGEBOS and ICTA). In five irrigations DIGESA and DIGESEPE were found, and only DIGESA in the remaining systems. In several cases the presence of DIGESA was probably in response to the fact that some beneficiaries were also DIGESA agriculture representatives and had worked for some time with DIGESA (El Jocotillo, Río Frío, Los Planes, for example). However, when asked about the activities carried out by them, these same agricultural representatives expressed doubts and noted the irregularity of institutional action. In not in one case was support from public institutions for marketing mentioned. In the case of systems that used technical resources from FEAT the opinions were more positive.

As for irrigation, DIGESA does not respond to farmers' needs nor does it fulfill its role of a service institution. 20% of the beneficiaries stated they received assistance once a year; 10% stated they received very little assistance; 40% stated they never received any assistance at all. This means that 70% receive practically no assistance. The remaining 30% receive constant assistance from DIGESA, almost always because among the irrigation beneficiaries there is at least one who works DIGESA.

It is evident that the technical assistance limitations are a critical and chronic problem, which is proven by the following statement:

- Since eight years ago we don't receive any technical assistance (Agustín Juracán: Concepción)

- They have visited us only in words (Eduviges López: Ixcá I).

Despite the above, the technical assistance given by DIGESA in some of the irrigation systems was said to be acceptable:

- It was good because it taught us about crops, distances and inputs" (José García: San Ramón).

In general terms, the following aspects of technical assistance were considered important: pesticide applications, planting of crops, good orientation, crop rotation, time of fumigation, etc. On the contrary, speaking of the technicians, some said that they "don't know them" (don Francisco, Encino Gacho). In El Jocotillo, the DIGESA technician said it was not worth while assistance to all of them because there was no way he could really know all the beneficiaries' problems. So assistance becomes selective and produces discontent in the group, and the more it produces individual benefit, the more accentuates social differentiation within the system.

Public sector institutions' technical assistance deficiency and the absence of non-government organizations to provide this service may not be that important (at least for the study sample). This is because assistance is often supplied satisfactorily by the agroexporters which buy the products directly from the irrigation beneficiaries. In this way, in the irrigation systems where their products are marketed this way (80%), technical supervision is constant, because this guarantees quality for the exporter. This is favorable for the farmer, because the assistance is accompanied by inputs for planting and other services that the exporter provides or sells.

The lack of technical assistance in the sensible use of pesticides is notable. Technicians usually limit their assistance to reading the instructions for their use; in no case to they provide training oriented toward explaining the short and long-term consequences of pesticide use on the environment (see next paragraph).

In other cases technical assistance is supplied by the technicians from FEAT, which has brought good results and has been carried out satisfactorily, due to the contractual relationship established.

Interinstitutional coordination is practically nonexistent, both between state and private institutions and inside the public sector. In Saspán, there has been coordination between DIGESA and DIGEBOS and the Trifinio project -CEE- especially regarding soil conservation, but this seems to have happened either from personal initiative or the ample funds of the Trifinio project, and not because of a joint action of the organizations. In the rest of the systems we did not find any evidence of coordination, at least from the viewpoint of the interviewees.

J. Pesticides: Types, Practices, Costs and Security in its Use

The use of pesticides seems to be high and with poor knowledge by the beneficiaries, who appear to depend on the agrochemical businesses and on the agroexporters. In almost all cases, the equipment used during application is incomplete, and there have been cases of poisoning (especially in the East-Center-North region). There are contrasts regarding the understanding of the effects of the use (or incorrect use) of pesticides on the environment in general and on the land in particular (a short term view prevails).

The types of pesticides used in the agricultural production in the different irrigation systems are determined by the type of product. The characteristics and similarities of the irrigation systems regarding altitude, climate, soil's organic composition, etc., allow for the cultivation of the same new crops in all the irrigation systems. This situation has permitted the general and very diversified use of different types of pesticides. The most common pesticides are the following: thiodan (in 80% percent of the systems), ambux (60%), tamarón (60%), folidol(40%), ditane (40%), volatón (40%), metasistox (30%), arroquim (20%), bondoseb (20%) and antracol (20%). The list includes others, like decis, dacomil, barrot, vitán, ridumil and gramoxone, which were mentioned only once and each of them in only one irrigation system.

Pesticides have the common characteristic that they are used by all the farmers of the irrigation system where they were identified. Another characteristic is none of the interviewees knew of any possible restrictions in their use.

The diversification of agriculture production in the different irrigation systems has brought a strong dependence on the use of chemical products. The wearing out of the organic composition of the soil through constant use means systematization in the use of chemical fertilizer without which the possibility of a profitable harvest is almost impossible. When the soil does not rest or when there is no rotation of the crops, the chemical fertilizer causes the soil to become exhausted (this opinion emerges from information given by some interviewees; other informants did not mention this problem).

On the other hand, the introduction of new crops has brought pests and illnesses unknown to the farmers, who have controlled their effects with the use of chemical products. The farmers' need for a good crop (economically speaking) has denied nature all possibility of balancing the natural cycle where the crop grows, meaning once again, the use of larger quantities of pesticides and of new products to attack the resistance of the pest.

So, pesticides are used in all the crops of all the irrigation systems. The only product in which no pesticide is used is corn (milpa); the reason is that it is not attacked by pests. Few pesticides are used with crops of little importance for most farmers, like coriander, peanuts, chili and rosa de jamaica, crops which are not found in all the irrigation systems. The crops that used pesticides the most are broccoli, potato, tomato, cauliflower, beets, carrots, green beans, onion, garlic, okra and anise.

As for the quantity of pesticides used in the crops, generally it is one or two Bayer measurements (1 Bayer measurement = 25 cm3) per 4 gallons of water. The variation depends on the specifics of the chemical product and on the crop on which it is used.

Regarding the knowledge of the quantities used by the farmers, there are two basic sources: technicians from DIGESA (in all the cases) and the label on the bottle. This is reinforced be the assistance given by the technicians from the exporters which buy the products in the irrigation systems and by the paid technical assistance (FEAT).

The costs of the pesticides used by the farmers in the different irrigation systems show are uniform. No significant variation was found, so its impact on production costs does not affect the competitiveness of the product in the market. There is a notable increase in the cost of pesticides (a generalized observation), caused by inflation, but as in all economic reality, it only affects the final consumer.

In general terms, pesticides' costs of more use are the following: tamarón, Q.60 per liter; metacistox, Q. 120 per liter, ambux, Q.60; folidol, Q.40. At first glance, the impact on the farmer is that they are "a little expensive" (a generalized expression), but when related to the market prices of their products, the reasoning of the farmer demonstrates his sense of the market. Thus, we find that the costs of pesticides are high "because sometimes the product which they (farmers) sell has a low price" (Jorge Díaz: Río Blanco Chiquito), or pesticides are expensive "because there are no big profits on the sale of products (Alberto Martínez: Buxup I), or "because much product isn't sold, it stays on the field or the prices are lowered" (Pedro García:San Ramón).

Regarding the equipment used in the application of pesticides, they use a back pack fumigator. The nature of the crops and the areas of land worked by the farmers do not require any other special equipment.

In our sample, 100% of the farmers use a pump to fumigate and could explain the equipment and how it was used in the application of pesticides. This last point is because there is no other way to

apply them: "without it we cannot fumigate" (Leoncio Sequec: Concepción).

Apart from this pump or backpack, other equipment used in the application of pesticides are rubber boots (in 60% of the farmers), gloves (70%) and mask, which in most cases is a damp piece of cloth (60%). Only one farmer said he used nylon to protect the body, two used sun glasses and 40% said they did not use any additional equipment.

One of the weaknesses in the irrigation systems are the security measures used by the farmers in the fumigation. This is important, regarding both the personal aspect and the impact which this activity has on environment. However, it is necessary to point out that a significant number of beneficiaries or their workers (even up to 60%) use protection measures that contrast with those producers who are not the systems' beneficiaries and do not use these measures.

The problem is critical, not only because almost half of the farmers do nothing to protect themselves, but because what they do use really is no protection. The use of special equipment for this kind of work was not mentioned in any of the cases.

Three aspects are crucial for this situation to change among the farmers. First, the problem is economic, for the purchase of this equipment constitutes an extra expense and therefore cuts into their income or profit. Second, knowledge of the impact of exposure to pesticides on the body, though it has advanced considerably, still needs additional efforts. Third, there is an excess of trust among some farmers who think fumigating with care does not cause any harmful effect. While in the West 100% of the interviewees affirmed that they had not had any problem with poisoning, in the East-Center-North several beneficiaries said they had had symptoms of intoxication (headaches and vomiting). Likewise, in this last region cases of poisoning of non-farmers were mentioned, both in laborers and community members (one interviewee said that in Los Planes the son of a beneficiary had died because of incorrect use of pesticides over a long period but this was not proven).

The farmers' way of solving a possible intoxication (at the moment of fumigation) is the following:

- You have to fumigate in the wind's direction, so as not to breathe the air with poison (Alberto Martínez: Buxup I).

But 40% consider it is not harmful or they don't know; the remaining percentage consider it can be harmful with time.

In this critical situation, the wage laborers working temporarily in the plots of the irrigation systems are the ones taking the greatest risk, for they carry out a series of tasks, including fumigation, without any protection. Regarding this situation,

> - the people who have problems are the ones hired, because they are not given any equipment (Salvador Mazariegos: Concepción Chiquirichapa).

Knowledge of the use of pesticides contains two aspects: the farmer's knowledge before entering the irrigation system and what is learned while he is in the system. 80% of the sample admitted to not knowing anything about the use of pesticides before entering the project. The rest knew something through their experience with traditional crops like potato, where pesticides have been used for a long time, or through their experience in the plantations in the coast. In the East-Center-North region, there is a significant number of members who feel the use of so much chemical product affects their lands. Some said "the soil is very acid", and they have begun rotating the land so as not to exhaust it.

Thus at present, all the farmers have some knowledge about the use of pesticides, but this knowledge is basic, limited and sometimes incorrect. What was already known and what was learned in the irrigation system are basically the same: how to use the pump, when to fumigate, which products for which crops, where to store the pesticides, and their application, all of which must be considered as significant gains of the Project.

As can be seen, it is still partial knowledge, the purpose of which is to make fumigation effective. Because of this, in some cases in the West, especially those who already had some information on the subject, the irrigation experience has not provided them anything new about pesticide use.

All the aforementioned explains the lack of knowledge of the farmers on the subject of the impact of pesticides on the environment. A very small number of interviewees said they thought pesticides contaminate the air "because it takes the poison away" (Eduviges López: Ixcá I) and the water, because "if it rains, the water is contaminated" (Pedro García: San Ramón). The rest of them think it may not cause any trouble, or they simply do not know.

K. Positive Impacts

An overall appraisal based on the interviewees' opinion is positive: higher production, income, job creation, decrease of migration, and diversification. The some results expected for the different stages of the PDA do not seem to have been accomplished,

except the production and income increase (in many cases up to 50%). Nevertheless, the unexpected results such as job creation, deceleration of the rural migration flow and decentralized regional development which the systems have stimulated are important to point out.

This section includes both expected and unexpected positive impacts. Our only parameter is the "expected results" corresponding to the three successive stages of the PDA (stage I,II,III). Many of the results mentioned come from quantitative goals which we cannot evaluate with precision. Likewise we think that other expected impacts are not mentioned here.

If we base our appraisal of the small irrigation systems on beneficiaries' comments, the appraisal is positive, despite the diverse problems. Thus, there is a diversity of answers which go from the openly critical to the passionate defense and support, but the average is found in an affirmative statement with reserves: "We're better, but..."

There is a group of indicators which seem to support this overall consideration. The interviewees speak of greater crops, higher prices, diversified production, less migration, better incomes, and a better level of life. However, the universal or most generalized indicator of the system was "we produce all the time."

It must also be observed that a subjective aspect of positive impact among beneficiaries rests on the satisfaction of watching the land irrigated during the dry season, which is considered extraordinary because of the simple fact of defying the natural conditions of the environment.

If the expected results for the three stages of the PDA are observed, they will not be found in the case studies. If we think of the forest handling, water shed and soil preservation, pesticide use, strengthening of the agriculture public sector and a minimum increase of 50% in production and incomes due to the application of new technology, the opinions seem to be negative, except the last one. Even when we could not measure the production and income levels, two thirds of the interviewees assured us of being in better economic situation and a better level of life.

Nevertheless, other positive impacts that were not contemplated clearly by the Program must also be mentioned. In the first place, the positive transformations created as a consequence of the production and impact in the rural employment structure. It is impossible to evaluate with our data what impact this may in slowing down temporary migration flows and the crops in the large plantations, but it has had, without doubt, a significant influence. If this program had not existed, temporary migration

would be an even greater problem. It must be observed, we insist, that the systems suppose both the disappearance of the migration cycle among beneficiaries and its diminishing among community neighbors or from nearby communities. This phenomenon has produced a break in the small plot-large plantation model and is an important stimulus in the regional modernization process which reevaluates the rural context.

From our point of view, there have been investments by beneficiaries regarding education, which should create a medium term impact that, from one point of view, can be considered positive because of the new alternatives which it creates, but maybe negative because education is related to the break with agriculture production and the successive technological transformation of the sector.

L. Negative Impacts

The most important negative impact consists in the deterioration of soils, water sheds and the environment as a consequence of inputs whose use was not totally rational (especially pesticides), and whose consequences will be felt in the medium and long term. It would seem that there is not a clear consciousness of its effects.

Although negative impacts seem to be more numerous than the positive ones, it does not mean that the positive appreciation aforementioned is negated. A negative impact still difficult to measure with precision is the effect of pesticides. A short term view prevails at present, based on production and agriculture process, and if these increase at a short term, the negative effects at medium and long terms are less important.

Related to the above and in contrast to the expected results, the handling of water sheds and agroforestry, together with soil preservation, seem to have had limited results. Moreover, as a consequence of the irrational use of agricultural inputs, a deterioration in the watersheds might be expected.

The introduction of the irrigation systems has made the intercommunity social differentiation processes more acute. As a result, there are richer irrigation system beneficiaries who control a valuable resource (water), and the rest of the poorer population, with no control over this resource.

Although not a negative "impact" but rather an unaccomplished goal, it must be mentioned in regard to the strengthening of the SPADA and particularly of DIGESA, there were no indicators found which could confirm it. On the contrary, many beneficiaries are critical of the work done by the State.

VI. Conclusions

A. General Estimation

According to the opinions expressed by most of the beneficiaries and despite the problems found, the perception is positive. The production and income increase are more important than the debts acquired or the deterioration of the environment.

B. Particular Conclusions

1. The process of resource creation of families who use irrigation systems essentially depends on agriculture.

2. The small systems give better results than the large systems because the difficulties in the large ones multiply and because of the difficulties practicing democratic decision-making. This is especially true when internal problems appear among beneficiaries. When some large systems showed favorable conditions (for example Concepción), it was because they obtained external institutional support, which may not be necessarily sustainable.

3. The gravity fed systems present less problems than the ones using electric energy. It seems that there was no plan to build systems independent of INDE's energetic supply, and that the cost of this service is the second most expensive in Latin America, being Guatemala one of the poorest countries of the continent.

4. From the technical point of view, errors occurred regarding the appraisal of the quantity of water needed to satisfy the beneficiaries' needs in all their land area or to satisfy the beneficiaries' needs during all the dry season.

5. The irrigation committees, although from the formal point of view they work legally, do not seem to play an essential role. The informal organization based on natural leaders is the one that makes decisions and imposes them among the beneficiaries.

6. Beneficiary solidarity to repair the systems or to solicit more favorable conditions in debts with BANDESA or INDE are notable.

7. In contrast to the previous conclusion, not many signs of initiative organized by the beneficiaries were registered for marketing.

8. Temporary migration flows of rural labor have slowed, but the flows to Guatemala City and to the United States tend to grow (especially in the East-Center-North region).

9. The small irrigation systems have created jobs which explains the decrease of temporary rural migration flows.

10. The intercommunity social differentiation process has become acute as a consequence of the introduction of the irrigation systems in some cases.

11. Under the irrigation systems, the production for the subsistence is less dominant. Even though corn and beans are present, the crops oriented to the local, national, or export and the first world market, are dominant.

12. The profits generated by the irrigation systems' incomes are invested especially in land. Luxury expenses are few.

13. The interest in the land under irrigation during the dry season is significant. This responds to the self-definition of farmers of almost the whole of the interviewees, a strong dependence on this activity and the prestige obtained from growing during the dry season.

14. There is a certain contradiction regarding the deterioration and exhausting of the soil, which is more evident in the East-Center-North than in the West, in which if the volumes of production and incomes are high, deterioration is not a real concern, although it may eventually affect the beneficiaries' land.

15. It is necessary to point out the progress achieved by the irrigation systems' beneficiaries regarding protection and security, even when these are still not optimum.

16. Access to credit increases when the beneficiaries cancel their debt with BANDESA. If they do not, they are not eligible for credit and must do without it or resort to loan shark credit.

17. In the East-Center-North region, market understanding is more common than in the West. But the introduction of the systems in the latter region, added to better levels of productivity and quality of the lands, are changing dramatically this contrast.

18. Marketing is still the weak point of most of the beneficiaries. Except for a few systems (eg. El Jocotillo, where all are relatives) there is no collective attitude oriented to better prices and markets.

19. Technical assistance of the agriculture public sector is deficient. NGO's do not support any of the irrigation systems visited. Interinstitutional coordination is practically nonexistent.

20. The process of agricultural diversification is notable. Most beneficiaries find advantages in this process, not only because they are better able to increase income but also because it is considered a lesson to be repeated (especially with their children).

21. It is necessary to point out that when the irrigation systems are successful and they incorporate vegetable gardens, they tend to place excessive work demands on wives and children (especially in the West of the country).

C. Impacts

The central positive impact consists of:

22. The increase of incomes and the level of life of the beneficiaries' homes.

23. Disappearance of temporary rural migration flows among beneficiaries' homes and its slowing down among homes of their area of influence.

24. Creation of temporary rural jobs.

25. Steady raising of the education level in the systems' beneficiaries' homes.

26. Economy and investment of beneficiaries in lands.

27. Deterioration of the quality of land and the environment because of the unsensible use of pesticides (and agrochemicals in general).

28. Relative knowledge of the environmental impact and appropriate use of technological packets among beneficiaries.

29. Significant advances in the protection of the person using pesticides.

30. Little organized action oriented to marketing as an initiative organized by the beneficiaries.

31. Acceleration of the process of intercommunity social differentiation.

VII. Lessons for the Future

1. This program should be repeated with certain adjustments. Although it presents many weaknesses, it is better than most projects in sustainable rural production.

2. It is obvious that, from a national view, the small projects are the most successful and are the ones commendable to repeat. Here, problems are minimized and results are higher.

3. Another important lesson consists in the need to carry out more detailed technical studies which so as to minimize the negative impacts, just as the impossibility irrigating all the land supposedly under irrigation or during all the dry season.

4. In future projects, it is necessary to pay more attention to the use of pesticides (and of inputs in general), so as to prevent the negative effects.

5. Despite the criticisms that could be made because of the introduction and diversification of new products which are strongly affected by market oscillations, beneficiaries consider it a learning experience. It has helped them in the change over from subsistence to commercial understanding.

6. It is not beneficial to oppose subsistence crops in the areas under irrigation, like corn and beans. In most of the cases, the irrigation beneficiary himself discovers the advantages of diversification and increases market crops which slowly replace subsistence crops.

7. It is important that in the future project implementers evaluate the impact generated by the heavy participation of woman and children in the irrigation projects. From our point of view, work places a burden on these social segments, causing them to neglect other important activities, both for biological and social reproduction (among married women) and for the improvement of the life conditions through education (especially for children).

NIPE is focused inwardly on the exploitation of labor.

The NIPE did not replace (& learn) it displaced them.

ANNEX: INTERVIEW INSTRUMENT

PROGRAMA DE DESARROLLO AGRICOLA
EVALUACION FINAL DE IMPACTO
ESTUDIOS DE CASO

GUIA DE ENTREVISTA PARA LIDERES Y CAMPESINOS

FECHA: ____/____/____ CODIGO: ___ ___ ___ ___ ___ ___

A. TIPO DE ENTREVISTA

1. Productores
2. Líderes
3. Mujeres

B. UBICACION DE LA ENTREVISTA Y DESCRIPCION DEL SISTEMA

1. REGION:_____ 2.DEPARTAMENTO:_____

3. MUNICIPIO: _____

4. NOMBRE DE LA COMUNIDAD: _____

4.A TIPO: 1. Cabecera municipal
2. Aldea
3. Caserío de aldea: _____
4. Cantón de la aldea:_____
5. Paraje de: _____
6. Finca: _____
7. Otro: _____

5. NOMBRE DEL RIEGO: _____

6. TIPO DE RIEGO: 1. Aspersión
2. Goteo
3. Manguera
4. Otros: _____

7. FUENTE DE ENERGIA: 1. Gravedad
2. Eléctrica
3. Combustión (bomba)
4. Otras: _____

8. FUENTE DE AGUA: 1. Superficial
2. Subterránea

9. AÑO DE INICIO DEL SISTEMA DE RIEGO: _____

10. EL PROYECTO SURGIO CON EL APOYO DE: _____

11. EL PROYECTO ESTA SIENDO APOYADO POR: 1. PDA
2. FEAT
3. Otros: _____ ☐

C. DATOS GENERALES DEL ENTREVISTADO:

1. NOMBRE: _____

2. EDAD: _____ años 3. SEXO: M _____ F _____

4. RELIGION: 0. Ninguna
1. Católica
2. Evangélica
3. Otra: _____ ☐

6. OCUPACION/PROFESION:
6.A Principal: _____
6.B Otras: 1. _____
2. _____
3. _____

7. SABE LEER Y ESCRIBIR: SI _____ NO _____

8. EDUCACION (Ultimo grado): _____
_____

9. IDIOMAS QUE HABLA:
9.A Idioma materno: _____
9.B Otros: 1. _____
2. _____

10. Grupos y organizaciones a los que pertenece o representa en la actualidad:

GRUPO/ORGANIZACION	CARGO ACTUAL
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

11. Grupos y organizaciones a los que perteneció o representó en el pasado:

GRUPO/ORGANIZACION	CARGO
1.	
2.	
3.	
4.	

OTRAS OBSERVACIONES

GRABACION:

1. INTRODUCCION

   a. Háblenos de la comunidad, por favor. Cómo es la gente, cuáles son los cultivos, que otras cosas hace la gente por aquí para ganarse la vida (pensando en alternativas no agrícolas). (Se pretende un breve perfil de la comunidad). Cuáles son los cultivos del riego en que usted participa?

   b. Háblenos de su familia, por favor. Cuántas personas viven en su casa? Es una familia o varias? Viven con usted algunas personas que no sean familiares? Quiénes?

2. ECONOMIA FAMILIAR

   a. De dónde vienen sus ingresos? (sondear para establecer qué viene del riego, que no viene vía agrícola y vía no agrícola -industria, artesanía, oficios, comercio, remesas, etc-Diferenciar cuenta propia de trabajo asalariado).

   b. Qué acostumbra usted (su familia) a comprar semanalmente. (se pretende establecer el tipo de canasta básica del sistema).

   c. Qué cosas ha comprado (inversiones importantes) en lo que va del año? (SONDEAR).

   d. Podría decirnos usted qué cosa compraba antes y qué ahora, hubieron diferencias? En dónde compraba antes del proyecto y dónde compra ahora que está en el proyecto? Cómpra más cantidad? Porqué? Cambió la calidad? (por ejemplo, más carne, productos empacados, etcétera).

3. UTILIZACION DEL TRABAJO

a. Qué extensión de tierra trabaja? (diferencie lo que corresponde a bajo riego y sin riego) Cuánto tiempo le dedica usted al trabajo en su(s) parcela(s)? (explique si se refiere al día, al año o a qué cultivo) Cuánto en las bajo riego y cuánto en las sin riego? Qué extensión de tierra tiene bajo riego?

b. Quiénes trabajan en sus parcelas. Su esposa? Sus hijos? Otros parientes? Trabajan en todas las parcelas? Sólo en las parcelas con riego o sólo en las sin riego? Hay alguien de la familia que no trabaja en las parcelas (que sea PEA)? Trabaja mucho o poco la familia en las parcelas? Hay gente de su familia que trabaje fuera de su parcela aunque viva en la finca?

c. Ahora que usted participa en el sistema de riego, usted migra? Migran otros miembros de su familia? quiénes? Con qué frecuencia? A dónde? Por cuánto tiempo? Que tan importante es ese trabajo para vida económica de hogar? Afecta la migración al sistema? (ojo, preguntar con cuidado e indirectamente).

d. Usted contrata a veces mozos o jornaleros? Cuántos jornaleros? Para qué parcelas? para qué tareas? Por cuántos días? cuánto les paga? Cómo les paga?

4. PARTICIPACION DE LA MUJER EN LA PRODUCCION AGRICOLA

a. En qué actividades agrícolas pàrticipan las mujeres que forman parte de su familia? Y cuáles no se les permite? (Se refiere a las parcelas con riego).

b. Desde qué edad participa la mujer en las tareas agrícolas? A las niñas qué tareas se les asigna? A las jóvenes y a las adultas? (Mujeres solteras)

c. En qué actividades agrícolas participan las mujeres casadas?

d. Antes del mini-riego, qué actividades realizaba la mujer en la agricultura? Cree que se han dado cambios desde que se inició el proyecto de riego? (sondear).

5. VARIACIONES EN PRACTICAS ENTRE TIPOS DE IRRIGACION

a. Qué tipo de sistema hay aquí? Cuándo se instaló? Desde cuándo está en operación? Qué problemas se presentan? Cómo los resuelven? Usted piensa que el sistema que utizan es el más adecuado?

b. Cuánto pago usted por el sistema? Todos pagaron igual? Fueron altos los intereses? Está atrasado? Dónde pagaban, en el riego o tenían que viajar a algún lugar? Todavía debe? Cuánto debe?

c. Paga por mantenimiento? Paga por electricidad o combustible? Cuánto al mes? Le pagan a alguna persona para que se encargue del funcionamiento? Cuánto le pagan? Le parece a usted que los gastos de operación son altos? Porqué?

d. Hay un grupo administrador? Está formado por gente del riego? Es siempre la misma junta directiva o cambia periódicamente? Usted está conforme con esta adminstración? Decide la junta directiva "de afuera" dicen lo que hay que hacer, cultivar y cómo comercializar? (ojo, preguntar con cuidado la ingerencia externa).

6. ASISTENCIA TECNICA INTEGRADA

a. Qué instituciones sirven aquí del sector público? Qué organizaciones no gubernamentales sirven aquí? (enumeración).

b. De qué instituciones se recibe asistencia técnica y con qué frecuencia? Qué tan buena es esa asistencia técnica? Porqué? Cómo trabajan? (pedir que describan el proceso). Qué beneficios obtiene de la(s) institución(es) que colaboran en este lugar?

c. Cada institución trabaja por su cuenta? Se coordinan actividades? Cuáles? Cómo? (pedir que describan el caso si existe coordinación). Qué piensa usted de la falta de coordinación o de la coordinación aquí utilizada?

7. MANEJO DE PESTICIDAS Y CONTAMINACION

a. Qué venenos se usan aquí? Cómo se llaman? Los usan todos o sólo usted?

b. En qué cultivos usa venenos? En cuáles no usa? porqué?

c. Digame el costo de los venenos que utiliza ? Le parecen caros en relación al costo de comercialización?

d. Tiene algún equipo para pesticidas? Lo utiliza? cuál? Quién se lc suministró? Lo compró o lo alquiló o se lo prestaron ? Le parece nesesario?

e. Cuánto pone de cada veneno? (sondear) Quien le informó?
f. Qué medidas de seguridad utiliza?

g. Qué problemas le ha causado a usted el uso de pesticidas? y a su familia? y a otra gente que usted conozca? Usted piensa que le puede causar algún problema?

h. Qué sabia usted antes de iniciarse en el proyecto sobre el uso de pesticidas? Qué cosa? Lo ponía en práctica? Qué aprendió durante el proyecto? Lo pone en práctica?

i. A usted le parece que el uso de pesticidas perjudica o no a su terreno? Y a los terrenos vecinos? Porqué? (En el termino terreno entra el medio ambiente en su conjunto) (SONDEE).

8. RESULTADOS NO ANTICIPADOS DEL PROYECTO

a. Hay ventajas en tener una parcela bajo riego? Cuáles son esas ventajas? (Sondee)

b. El ingreso suyo es mayor, igual o peor antes de iniciarse el proyecto de riego que ahora? El servicio FEAT, mejoró o no sus condiciones de vida e ingresos? (Sondee).

c. Tiene más acceso al crédito con el riego? si o no? porqué? (Sondee).

d. Con el riego a diversificado los cultivos? (Pedir que comente su caso, ya sea por estar diversificado o no).

e. Con su participación en el sistema de riego se le ha facilitado la comercialización de sus productos? Cómo? Con quién?

f. Ha mejorado su calidad de vida? (Sondee y pida que comente su caso).