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HONDURAS
NATURAL RESOURCES MANAGEMENT PROJECT
SECOND EVALUATION REPORT

AID Project 522-0168
Agriculture and Rural Development Office
U.S. Agency for International Development
Tegucigalpa, Honduras

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PREFACE

The Honduras Natural Resources Management Project, NRMP, was evaluated by a team from Tropical Research and Development, Inc. (TR&D), which included:

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The team arrived in Honduras on January 12, 1986 and left on February 4. Follow up benefit/cost calculations were made by Dr. Badger after the field period. The report was edited in the home office of TR&D and the report presented to AID in Tegucigalpa in March, 1986.

The team wished to thank Ing. Carlos Rivas, Director of the Ministry of Natural Resources' NRMP and Paul Dulin, Leader of the Chemonics technical assistance team and their respective staffs for their careful preparation for the evaluation, candid response to innumerable questions and logistical support. We also greatly appreciate the close collaboration of AID, particularly John Warren, the Project Manager, whose openness and hospitality made a very tightly scheduled evaluation both productive and enjoyable.

EVALUATION OF THE CHOLUTECA NATURAL RESOURCE MANAGEMENT PROJECT

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I. PROJECT EVALUATION SUMMARY

SUMMARY

The Natural Resource Management Project (NRMP) in Honduras (AID 522-0168) has made excellent progress at developing and implementing a program of rural extension and natural resource conservation activities. In this respect the program is essentially on-schedule once an initial 2-year period of inactivity is discounted. The project has provided benefits to over 3,000 small farmers and their families, and this evaluation indicates that the project enjoys a benefit/cost ratio of 3.7.

The Project's success in the field serves as an evolving (and improving) model for rural development efforts in Honduras. The evaluation determined that expansion of the role of paid campesino para-technicals and more selective use of subsidies will permit the eventual expansion of the technically sound project experience to a national scale within the budgetary constraints of the Ministry of Natural Resources. It is recommended that the training of professionals who will select, train and advise para-technicals be expanded as part of the NRMP extension and Phase II.

Institutional development activities should focus directly on the support of primary field efforts in training, soil conservation and production with the several valuable support activities such as storage and marketing, involvement of women and the strengthening of local self-help

groups. Support to the National Cadastre is valuable in and of itself, but the natural resource information generated is more appropriate to regional planning and policy than it is to the very specific farm level interventions that are the strength of the NRMP.

EVALUATION METHODOLOGY

This, the Second Evaluation, was undertaken with three principal objectives in mind: (1) evaluate the progress made to date and make recommendations for changes which will improve project performance during the remainder of current project life; (2) analyze the economic benefits and costs associated with the project; and (3) make recommendations concerning the desirability of a follow-up Phase II project, and the strategies which should be implemented in such a project.

A six person evaluation team spent 103 person-days in Honduras over the period 13 January - 3 February, 1986. The team interviewed AID, project and national government personnel, conducted either formal or structured interviews with 190 campesino men and women who have participated in the project, and examined field activities and results in 14 of the 22 project field offices. These field data and other information obtained were used to synthesize recommendations and perform the economic analysis. The key agencies involved were the Ministry of Natural Resources through the Director of the NRMP, Carlos Rivas and his staff, and the AID Agriculture and Rural Development Office, John Warren, Project Officer.

EXTERNAL FACTORS

Initiation of field activities was delayed by approximately two years (from 1980 to 1982) due to budgetary constraints in the national government and political-institutional problems associated with the provisional military government. The project has enjoyed high host government priority since mid-1982.

The national government changed during the final week of this evaluation, and it is too early to tell whether this change will significantly affect host government priorities with respect to this project.

INPUTS

Essential, high quality technical assistance has been provided to the project through a contract with Chemonics International, but the technical assistance contract expires in May 1986. An extension of TA services will be essential to further refine the resource conservation/rural development strategy being demonstrated by this project so that a fully developed and tested model will be available for follow-up Phase II activities.

OUTPUTS

After 2-1/2 years of field activity the project has reached over 3000 campesino families, as compared to the 5-year goal of 5000. If the first two years of inactivity is discounted (1980-1982), project field activities can be considered on schedule. Furthermore, responses from

the 190 campesinos formally interviewed revealed an astoundingly high level of acceptance; not one of these 190 individuals had complaints about the project, and most were enjoying important and recognizable benefits. Probably the most important benefit has been the increase in yields of basic grains; not only can this largely reduce the spectre of hunger (maiz, sorghum, and beans are the dietary staple), but it also reduces the area under cultivation thereby magnifying soil conservation benefits. Of critical long-term significance, the project is developing and demonstrating a rural extension/resource conservation strategy which can effectively reach the nation's campesino population.

Outputs in the National Cadastre and Water Resources components of the project have not met established goals in the area of institutional development, but this has not affected the project's more important field activities.

PURPOSE

The approved project purpose is to implement natural resource conservation activities in the Rio Choluteca watershed: (1) to strengthen the institutional mechanisms through which the GOH manages the country's natural resources; (2) to undertake an action plan in selected watersheds to increase farmer's incomes; and (3) to conserve soil and water resources through the introduction of modified agricultural and forestry activities.

The extension/resource conservation model being demonstrated and refined in this project represents a major advance in the national institutional capability. However, progress toward institutional strengthening in the National Cadaster and Water Resource program, though significant, falls short of project goals.

Effective soil conservation and agronomic practices have been implemented on over 3000 small farms to date, and the activities undertaken to date are demonstrating that appropriate, resource-conserving farm technologies can improve living standards. If project effort is sustained, it is expected that the benefits achieved will be long-lasting or permanent.

GOAL/SUBGOAL

The two principal goals the project seeks to achieve are: (1) the conservation of soil and related resources; and (2) increased income and food production on campesino farms.

Progress toward both conservation and income goals have proceeded hand-in-hand, since the specific small farm technologies promoted by the project are effective in addressing both goals simultaneously. Principal features of this technological package include: (1) construction of soil conservation structures as an integral component of technology for achieving increased yields; (2) reduction in acreage planted is made practical by yield increases; and (3) focus on agro-forestry and

cut-and-carry systems to reduce the grazing pressure on degraded soils. Achievements in this direction are attributable entirely to project activities.

BENEFICIARIES

The direct beneficiaries of the Project are those small farm families in the Choluteca watershed (maps 1 and 2) who receive technical assistance, grants, and loans which contribute to family income and welfare. At the end of 1985 the following number of persons were participating in various activities undertaken by the Project:

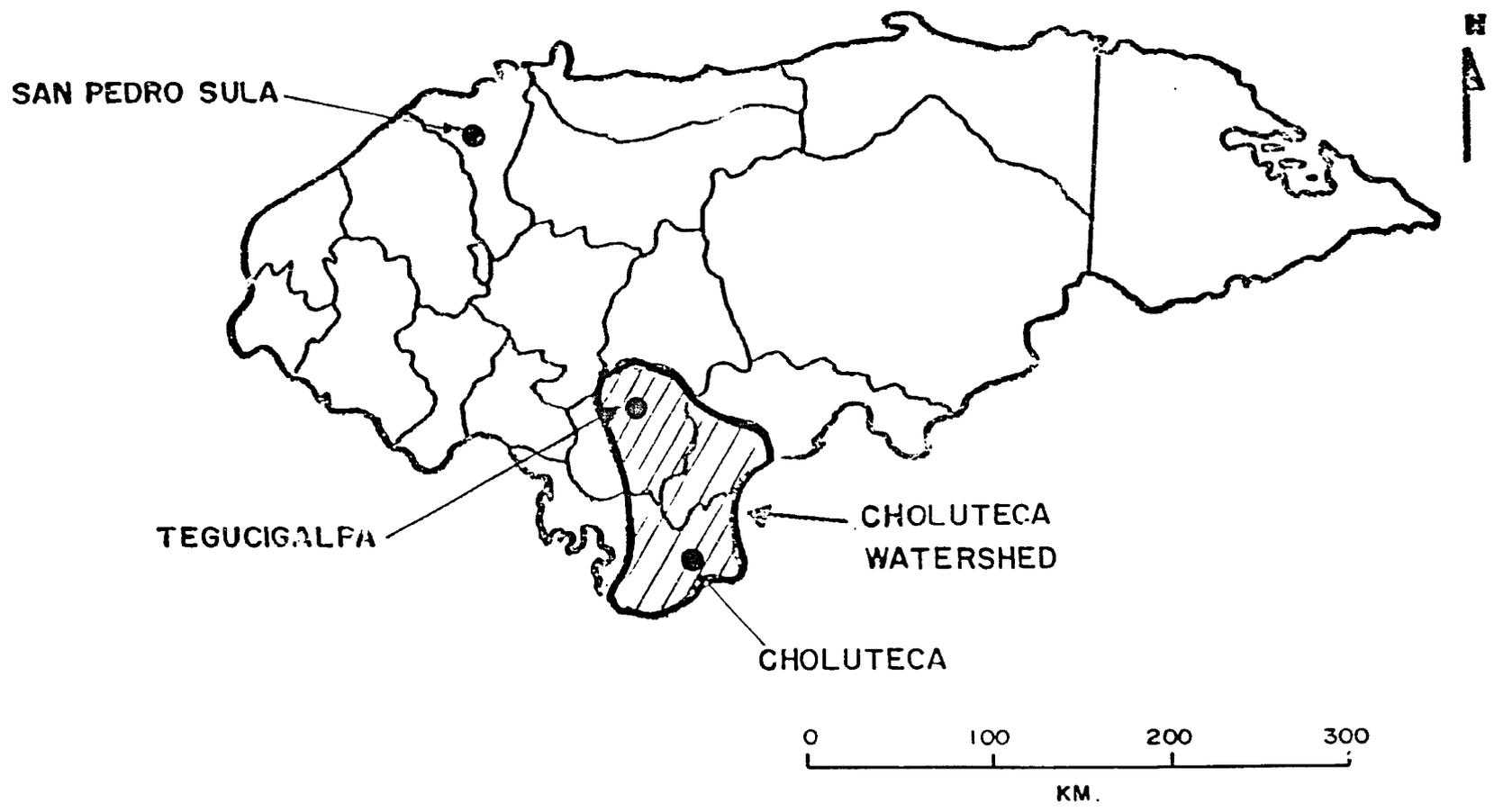
	<u>#INDIVIDUALS</u>
Participate in Farmer Groups*	2,573
Soil Conservation Works	2,167
Basic Grains	2,115
Vegetables	750
Pasture Planting and Management	362
Home Economics	316

*The groups are the focal point of technical assistance activities.

The methodology being developed and demonstrated by the Project will be applied to additional areas in Honduras, potentially extending the scope of the eventual beneficiaries nationwide.

REPUBLICA DE HONDURAS

MAP I
Location of the Choluteca Watershed





MAP 2
Location of the NRMP Watersheds

UNPLANNED EFFECTS

No unplanned adverse impacts were observed.

LESSONS LEARNED

1. That there are not enough professionals to reach all the small farms in need of assistance - the efforts of dedicated professionals must be multiplied through the training of para-technicians working among their own people.
2. That institutions tend to be compartmentalized. Programs, materials and information from other government and private agencies and groups could be effectively tapped to benefit campesinos participating in the NRMP. Cross fertilization among AID projects would be particularly valuable - many activities of the Rural Technologies Project are directly applicable to the NRMP.
3. That statistical data gathering during the course of a project should be directly relevant to the measurement of the accomplishment of development goals. Benefit/cost analysis is easier to perform and more useful if the data is gathered during the course of a project with that goal in mind rather than reconstructed at the time of an evaluation.
4. That benefit/cost analysis is a measure of the accomplishment of project goals, relevant only in the broader context of a qualitative and quantitative assessment of accomplishments in human development.

SPECIAL COMMENTS OR REMARKS

A Phase II project is recommended that represents an extension of the present project, geographically and in time leading to a nationally integrated program.

A geographic extension of the project should be into the coastal zone of the Choluteca watershed and the Amapala area where a collaborative effort between NRMP and the Partners project would be in order where campesinos would benefit from appropriate management of different natural resources.

If the benefits from major investments in the National Cadastre program are to be fully justified, additional assistance in geographical information management is needed.

II. EXECUTIVE SUMMARY

The evaluation team believes that the NRMP has been successful in developing an approach to rural extension and natural resource conservation. The project is addressing issues which are difficult to resolve: campesino extension, resource conservation, and development of the corresponding institutional capabilities and linkages. Complete success has not been achieved, and cannot realistically be expected. However, the evaluators feel strongly that the project has attained important goals and is progressing in the right direction, despite institutional and other obstacles. Furthermore, the resource conservation and rural development strategies being demonstrated by the project can serve as a workable model for delivering appropriate extension and resource conservation technology to the campesino community.

The evaluators found it remarkable that in the course of approximately 200 formal and informal interviews with campesinos, only one individual made disparaging remarks about the project and its accomplishments. This represents an impressive level of acceptance and is indicative of the project's impact to date and potential for future impact. Crop yields in basic grains have been more than doubled in some areas as a result of the project, an important accomplishment when hunger is common. The economic analysis reveals a 1980-1990 benefit/cost ratio of 3.7 for the project.

This evaluation emphasizes recommendations for improvement of the present project, as well as for a Phase II project.

The following recommendations are justified and explained in the text of the evaluation.

1. Expanded role of para-technical campesinos. The "Productores de Enlace" component of the NRMP represents a positive step in this direction, but needs to be further expanded to emphasize the use of salaried campesino para-technicians on a full-time (rather than voluntary) basis. This concept should also be expanded to include the use of women campesinas to support women-in-development activities.
2. Preparation of extensionists. The quality of the training that extension agents have received is uneven. Before initiating fieldwork, a period of in-service training and evaluation with an experienced extensionist is recommended. Training should be re-oriented to prepare extensionists to work with para-technicians rather than directly with campesinos. Training of extensionists should help them function as generalists, not as specialists in forestry, agronomy, etc. in the broader context of the small farm system in which campesinos actually live. If a proposed agronomic practice is too technically complex for a forester to fully understand and communicate to a campesino, then the technology is inappropriate. An extensionist

trained in a particular field may be called upon from time to time to provide specialized consultation to other generalists, however.

3. Central office linkages. The linkages between extension agencies and technical specialists attached to the central office needs to be strengthened. The current informal mechanism does not work well, and two levels of supervisors separate technical and field personnel in the existing formal organizational structure. In particular, better linkage is required to assist quality evaluation of fieldwork and to facilitate the two-directional flow of ideas, problems, strategies, etc.
4. Role of women. Reinforce the role of women in the program: focus on productive activities insofar as possible, improve the level of training orientation for women "promotoras", and provide a women-in-development (TA) position to help strengthen the woman's component. Women constitute one-half the rural work force and their economic role in the family is very important.
5. Crop diversification. Emphasize a greater diversity of minor crops rather than propagating large numbers of a few species (i.e., oranges). The promotion of a diversity of edible fruits in particular has a large potential which the project has barely tapped. Grafting techniques, use of varieties to extend the production season, and introduction of non-traditional fruits should all be pursued. A TA position in agro-forestry/tree crops is recommended.

6. Forest management plans. Although over 50 percent of the Choluteca watershed is in forest (pine, broadleaf or scrub), the implementation of rational management for saw timber is frustrated by legal and institutional impediments. A joint NRMP-COHDEFOR commission should be created to establish procedures for preparing simplified Forest Management Plans for fuel wood plus saw timber production on small areas.
7. Information management. The project needs an improved Management Information System. Much data, marginally relevant to project management and rural development, is being collected. Valuable field data is not being organized to facilitate effective management. In the field, record-keeping should be oriented toward the farm rather than keeping separate files for each activity (e.g., soil conservation, forestry, agronomy). This should help promote the farm system concept, as well as facilitate reporting. If AID requires benefit/cost data for its own reporting functions, then such needs should be defined and contractor responsibilities established and funded. Such data are difficult to generate after-the-fact.
8. Access to Cadastre data. A massive amount of natural resource data have been compiled and computerized by the National Cadastre at considerable effort and expense. However, the computer terminals and programming required to enable these data to be accessed by users in both the public and private sectors has not been provided, although this was designed to be an essential element of the National Cadastre

component of the NRMP. This impasse should be resolved, since the accumulated data are of little use if they cannot be easily accessed.

9. Watershed management. Integrated watershed management should be re-emphasized in the NRMP and any follow-up activities. Appropriate watershed-oriented activities could include community reforestation, revegetation of high erosion areas and soil conservation activities in critical water supply watersheds (overlooked by the NRMP to date, apparently in the interest of working in more densely populated areas where the people impact would be greater).
10. Vertical integration. The areas of marketing and appropriate farmstead technology in such areas as storage of grain, have not been emphasized in the NRMP. Both of these areas will gain considerable importance to support a variety of NRMP initiated and independent rural development activities. Both activities need emphasis in the future and should be specifically provided in any Phase II project, either as a project component or through strong linkages to other projects or institutions. The use of PVOs may be a particularly appropriate source of appropriate technology resources.
11. Vermont Partners. The Vermont Partners Project at Sabanagrande has achieved good results and operates as a useful demonstration of some strategies which can be very useful to the NRMP. It is extremely useful to have an organization of this nature to develop and demonstrate alternative rural development strategies, and we strongly

urge AID to continue funding Vermont Partners activities in the future.

12. Quality of Technical Assistance. The Chemonics TA team has done an excellent job and has made a major contribution to project success. In order to implement the recommendations in this evaluation and to properly refine the NRMP extension strategy in preparation for a more effective Phase II project, it is recommended that technical services be provided to the NRMP in the following areas: extension and training, soil conservation and watershed protection, women-in-development, and agroforestry and fruit trees.
13. AID Project management. The NRMP warrants full-time coordination and oversight from the AID Project Manager to insure the consolidation of accomplishments achieved to date, and to refine project strategy for implementation in a Phase II project.
14. Productor de Enlace. The NRMP should initiate a special program to implement the salaried "Productor-de-enlace" concept. One purpose for this agency would be to gain experience with the "Productor-de-Enlace" and two-stage extension concepts outlined in this evaluation ("Rural Development Extension" section). The island of Amapala may serve as an appropriate "laboratory" for refinement of this concept prior to wide-scale implementation.

III. INTRODUCTION

A. OBJECTIVES

The 5-year Natural Resource Management Project (NRMP) for the Choluteca Watershed began in 1980. However, due to lengthy start-up delays, the project did not begin field activities until mid-1982, resulting in a project extension through June 1987. The first project evaluation was performed in late 1983. Objectives of the second evaluation are to:

1. Assess project activities and provide recommendations for project orientation during the 1 1/2 years of the project extension.
2. Quantify the benefits realized by the project to date and project benefits which are expected as a result of project completion.
3. Recommend strategies to be implemented in a follow-up (Phase II) project with a broader geographic focus.

B. METHODOLOGY

This evaluation is based on a 3-week period of field data collection and analysis in Honduras (January 13 through February 3) with data analysis and report preparation activities continuing until March 15. The evaluation team consisted of 7 members with the following specialties: water resources management, agricultural economics, anthropology, agroforestry, forestry, and geography.

A list of team members and a description of their background pertinent to this evaluation is attached as Appendix 1.

The project was evaluated based on field observation and interviews with project personnel in the central office and 14 field offices ("agencias"), local government officials, AID offices, and small farmers (Appendix 2).

In addition, a total of 92 small farmers were interviewed using the questionnaire in Appendix 3, and 98 women were interviewed using the structured interview guide shown in Appendix 4. All interviews were conducted in Spanish by members of the evaluation team.

Team members also observed and analyzed soil conservation projects, natural resource data and analysis products and other outputs and activities in order to better determine project impacts, and numerous documents relating to the project were reviewed.

Two types of evaluation analyses were conducted:

1. Qualitative Evaluation--assessed the overall functioning of the project, the quality and sustainability of its outputs and institutional impacts, using all the available information; and
2. Quantitative Evaluation--the stream of economic benefits

generated by the project were estimated on the basis of interview results, inspection of products generated by the project, and the application of economic valuation techniques. These benefits were compared to project costs within the framework of a benefit-cost analysis.

C. CONSTRAINTS AND LIMITATIONS

The principal constraint to this evaluation is the difficulty in quantifying the stream of economic benefits. Several problems are particularly important in this respect.

The project focuses considerable effort on institution-building, and the benefit stream from activities in this area are particularly difficult to quantify.

The principal project beneficiaries are small hillside farmers who typically farm or sharecrop less than 5 Ha. of land. While these farmers have obviously benefited from project activities, it has been difficult to quantify these benefits because these farmers keep no records and have only an approximate feeling for the increase in income they have received. Thus, while their responses during interviews clearly indicate that an increase in income has been achieved, in most cases they are unable (or unwilling) to provide a quantifiable estimate of these benefits.

Important social benefits which have accrued to the small farmers are extremely difficult to quantify. Benefits in this category include the increased economic stability provided by crop diversification and the improvement in diet as families begin to consume the surplus of vegetable crops which are grown primarily as a cash crop. This is an important benefit of women's extension work, which has generated increased awareness of the nutritional value of non-traditional crops and taught methods for preparing these foods.

Finally, there is a scarcity of reliable economic data on the small farm sector. As a result there are few reliable "baseline" or "pre-project" data to serve as a point of departure for the quantitative evaluation. A cross-sectional rather than a time-series approach has been used as the basis of comparison of pre and post-project conditions.

The evaluation team has made every effort to quantify these important project benefits within the limitations imposed by the evaluation time frame and the available data. While these limitations have forced us to make certain value judgments and assumptions, every effort has been made to insure the reasonableness of the assumptions used in the quantitative analysis.

IV. PROJECT SCOPE AND MANAGEMENT

A. SCOPE

The Natural Resource Management Project (NRMP) was designed in 1980 to address environmental and agricultural development problems of the Choluteca River Watershed. The 5-year project has three major components: watershed management, policy and planning, and data collection and analysis.

Watershed management

Initially, the project was to encompass five submanagement areas. Due to equipment and personnel difficulties, technical assistance at first was confined to two subwatersheds: Cabeceras (the area immediately surrounding the capital city of Tegucigalpa) and Sanapile (the region near the city of Choluteca). In 1984, two additional subwatersheds were added to the scope of the project: Texiguat and Oroquina, located between Tegucigalpa and Choluteca. The fifth subwatershed, Nanfle, situated in the eastern corner of the watershed has been cancelled from project activities primarily due to distance and isolation.

Each subwatershed has been divided into outreach areas serviced by a central office or agency (agencia). At present, there are 23 agencies operating in the four subwatersheds. The personnel at each agency vary in number and composition but typically include (1) an agronomist; (2) a

forester; (3) a male social promotor; and (4) a female social promoter. In some agencies there may also be present a cattle specialist and/or aquaculture advisor. One of these individuals is designated as the agency supervisor and is responsible for reporting agency progress to the field supervisor working out of either Tequigalpa or Choluteca. These two field supervisors report in turn to the administrative and technical staff located at the NRMP office in Tequigalpa.

As part of the watershed management component, each agency was to deliver technical assistance in the following areas:

1. Promotion, extension, and training
2. Conservation of soils
3. Agroforestry and reforestation
4. Cattle and range management
5. Water quality control
6. Home economics
7. Horticulture
8. Aquaculture (Selected agencies on a trial basis).

B. PROJECT MANAGEMENT

There is a need to improve the linkage between the technical specialists and field agents. Please refer to the section titled "Rural Development Extension" for a more thorough discussion of this topic.

Technical Assistance

The evaluators feel that the Chemonics Technical Assistance (TA) team has done an excellent job, and the dedication of the members of the TA team has contributed substantially to the project's accomplishments.

In some cases, the TA personnel have had to work without national counterparts, in one case for over one year, which contradicts the premise that benefits result from interaction between the TA personnel and their national counterparts. Also the absence of a national counterpart puts an excessive workload on the TA personnel and thereby diminishes their effectiveness. If a decision is made to extend TA activities, as recommended below, this situation should be corrected.

The technical assistance contract is scheduled to terminate in May 1986. It is recommended that technical assistance activities be continued. This will be particularly important if a Phase II project is going to be implemented; an effective TA team will be essential to assist in the implementation of the recommendations contained in this evaluation and the further refinement of the extension and soil conservation approach

that will form the basis of implementing an expanded, high-impact Phase II project. Specific areas recommended for additional TA activity are:

1. Extension and training;
2. Soil conservation/watershed protection;
3. Women-in-development;
4. Agroforestry and fruit trees.

USAID Project Management

The NRMP is a complex project whose ultimate success depends in large part on the creation and maintenance of inter-institutional linkages and the institutionalization of the campesino-oriented extension model which it is developing. Furthermore, the project has a high potential for expansion, eventually into a national model for rural development and resource conservation. As such the project warrants full-time coordination and oversight from the AID Project Manager to insure the consolidation of accomplishments achieved to date.

One activity in particular which needs more attention from AID is the organization of project reporting procedures in order to provide the types of information which AID requires for project evaluations and for justifying follow-up activities. There appears to be a lack of coordination between AID and the project with respect to reporting, particularly in the organization of data required to calculate economic benefits.

It is our impression that adequate data are being collected in the field and additional field data collection requirements should be discouraged because they reduce the time extensionists have available to work with campesinos. It appears that field data are not always forwarded to the central office in a timely manner (e.g., results of demonstration plots), and that the data received are not organized or reports in the most useful fashion.

V. INSTITUTIONAL DEVELOPMENT

A. GENERATION AND ANALYSIS OF NATURAL RESOURCE DATA

Significant Accomplishments

Two basic activities are envisioned in Revised Annex L, "Amplified Project Description":

1. Enhance data collection capability of the Directorate of Water Resources within the Ministry of Natural Resources
2. Improve the capability of the National Cadastre Program to compile, analyze and disseminate natural resource data.

Ministry of Natural Resources. The use of NFMP funds focused on provision of technical assistance, purchase of monitoring equipment to strengthen and expand the existing hydrologic data collection network, plus provision of two vehicles.

National Cadastre Program. The project supported a major natural resource analysis effort in the Choluteca watershed which, to date, has generated the products summarized in Table 1. Additional products are in preparation.

The project has also funded aerial photography (1:40,000 scale) for the entire Choluteca watershed and the preparation of 1:10,000 scale ortho-photo maps. These maps form the essential base for natural resource

Table 1. Summary of Environmental Data and Analysis Prepared by National Cadastre Program in Support of NRMP

SOILS

1. Maps of soil types (scale 1:50,000)
2. Maps of soil slope (scale 1:50,000)

VEGETATION, ECOLOGY AND LAND USE

1. Life zones, Holdridge classification system (scale 1:50,000)
2. Land use (scale 1:50,000)

WATER RESOURCES

1. Isoheyt maps (1 annual and 12 monthly, scale 1:250,000)
2. Isotherms (1 annual and 12 monthly, scale 1:250,000)
3. Isolines of potential evapotranspiration, Thornthwaite (1 annual and 12 monthly, scale 1:250,000)
4. Thornthwaite climatic classification map (scale 1:250,000)
5. Precipitation data, monthly, for 495 stations (computerized)
6. Relative humidity, monthly, 50 stations (computerized)
7. Daily streamflow, 95 stations (computerized)

COMPUTER MAPPING

Political boundaries, watershed boundaries, climatic and streamflow stations, isoheytes, isotherms, potential evapotranspiration

ANALYTICAL PROGRAMS

Computation of water balance and its components; analysis of various rainfall statistics; log-normal, log-Pearson Type III and Gumbel-I analysis of streamflows; climatic classification using Thornthwaite and Hargreaves methods

planning as well as the ongoing Land Titling Program (AIE project 0173) in the Choluteca watershed.

This represents the first time that a comprehensive natural resource inventory has been prepared for an entire watershed in Honduras, as well as the first time that a climatological-hydrologic data base has been prepared. The data base contains most hydrometeorological data from the Choluteca watershed and a significant percentage of that available from the remaining area of Honduras.

Despite delays in this portion of the project, the results which have been achieved to date forms a solid basis for the future use of environmental data in planning activities. The new Intergraph interactive graphics system (based on a VAX 730) which was purchased with project funds was being installed at the time of this evaluation, and will greatly expand the Cadastre work capacity beyond that which was possible using the older Intergraph system (based on a PDP-1134), which will continue to be used.

Constraints Environmental data has little value unless it is used effectively, and its value grows in proportion to its level of use. Unfortunately, relatively little use has been made of the available data by the project or other agencies to date. Several factors appear to be important contributors to this problem:

1. Much of the Cadastre data and analysis were not available in a timely and complete manner, and thus were not available for the planning phase of the NRMP.
2. The Cadastre program has been severely affected by national government budget cuts and is now largely supported through USAID funding.
3. The computer facilities have been inadequate in relation to the computer-oriented workload, particularly with the computer-intensive mapping activities associated with the Land Titling project.
4. There appears to be a lack of understanding in Cadastre as well as the potential user agencies as to the way that environmental data can be used or the manner in which the data can be made available to potential users to enhance its utility.
5. There is no emphasis within Cadastre on the development of user-oriented data and analytical products. Cadastre has not oriented its environmental data activities and products toward serving a larger clientele, but rather there is the feeling that these products have been developed as a "one shot deal" for the NRMP.

Furthermore, the Project Paper specifically envisioned that Cadastre would provide a separate computer room in which four computer terminals will be made available to other agencies, private firms, and others,

software to support these terminals. This has not been done and is a critical omission. Access to the data continues to be dependent on Cadastre's limited staff resources, which frustrates the most basic objectives of this activity as originally conceived in the Project Paper.

Recommendations

The activity which has not yet been undertaken by Cadastre will be to promote effective utilization of the data which has been compiled and computerized. The true clients for use of environmental data are the technical and professional personnel with the various government agencies and the private sector. Therefore, the activities designed to promote the better utilization of environmental data must be oriented first and foremost toward this group.

The basic strategy which must be implemented to promote the use of environmental information in planning and design is to show technical personnel the benefits to be achieved from using this data, and to make the data and analytical tools READILY available to professional personnel as well as professionals-in-training. The following specific activities are recommended.

1. Prepare a user-friendly program and accompanying documentation which will enable users to access environmental data and conduct analysis without a knowledge of programming or guidance from

Cadastral staff. This will permit the widespread use of digital environmental files, and particularly the hydrologic data base, without creating additional workload for the Cadastral staff. Essentially, the system should not be approached as merely an environmental data base, but rather as a complete ENVIRONMENTAL ANALYSIS SYSTEM. Few people are interested in the raw data itself, which is difficult to work with. However, there is a broad need for all types of analysis to answer questions such as "How much rain fell in Cholulteca during each of the past five winter planting seasons?" It is the ability to get useful answers from the system that is important to users, and this is the need which the analysis system must address. Technical assistance will be required for the design of this Environmental Analysis System.

2. Publicize the availability of environmental data, the analytical programs available for the analysis of these data, and the benefits that can be achieved through the more thorough and rapid analysis which can be achieved using the system.

Appropriate avenues for publicizing the system include seminars, conferences, university courses, and case studies. For example, every university student graduating in technical areas such as agronomy, engineering and natural sciences should have at least one session on the system to become aware of its existence and familiar with its capabilities. Training should also be offered through professional associations.



The use of case studies will be particularly important, since they are uniquely useful for demonstrating the manner in which the system can analyze real-world problems in planning and design. University students should be encouraged to develop, test and document new applications as part of their thesis and other research activities.

Effective use of the installed environmental information processing capability could be achieved by establishing an automated Geographic Information System (GIS). Establishment and implementation of a GIS would require Technical Assistance not envisioned in the present project, but which could be included in Phase II.

B. CONSERVATION OF SOIL AND RELATED NATURAL RESOURCES

Soil Conservation with Subsidies: The NRMP Approach

A variety of on-farm soil conservation and related reforestation activities have been undertaken as the primary mechanism for conserving natural resources. Activities have included implementation of agroforestry systems as an alternative to "slash and burn" agriculture, construction of on-farm soil conservation structures through a program of subsidies, minimum tillage ploughing on the contour (as opposed to use of planting holes) and education of farmers and school children on the importance of resource conservation.

The principal types of soil conservation works promoted by the project are rock walls, bench terraces, and rock-lined drains. These have been constructed using subsidies equal to the total value of the time and materials invested in the project by the farmer, resulting in a 100 percent subsidized cost.

In the Cabeceras region, subsidies have been paid 50 percent in cash and 50 percent in agricultural inputs. In the Southern region, the subsidies have been in the form of food-for-work. In the South, the project has administered food-for-work donations available through other donor agencies (CARE, COHAAT) rather than using the project's own subsidy account.

The Choluteca watershed (excluding the small portion in Nicaragua) encompasses 7,586 square kilometers, of which 3,063 square kilometers is in subwatersheds targeted by NRMP activities.

About 28 percent of land area (85,800 ha.) in project subwatersheds is in active agriculture, urban, and dwelling areas, and agricultural areas in pasture/fallow rotation. Statistics compiled by the project office indicate that 858 hectares have received soil conservation treatment as of year-end 1985.

Several factors indicate that the soil conservation activities undertaken to date are far more beneficial than suggested on an area basis alone:

1. Most of the lands which have been treated are intensively managed agricultural soils on steep slopes and which are highly susceptible to erosion.
2. Field interviews indicated that farmers have become highly conscious of soil conservation benefits, most commonly citing the elimination of rill erosion. Many farmers indicated that they had plans to install additional soil conservation measures in the future. In some areas farmers reported that they have stopped burning as an erosion control measure. This represents a dramatic change in awareness among campesino farmers due to project-sponsored activities and constitutes the essential basis

for sustaining soil and other natural resource conservation activities in the future.

3. With yields of basic grains being nearly tripled in some areas as a result of using improved agronomic practices, the area dedicated to production of basic grains could be reduced by two-thirds. Thus, for each hectare which is treated, another two hectares could be removed from cultivation and placed into a less erosive land use (e.g., most probably pasture or pasture-forest).

A reduction in cropped area occurs because basic grains (the principal crop) are produced for family consumption rather than market. There is little incentive to increase production beyond the family's needs. Although this issue was not explicitly covered in the questionnaire, several farmers explained that they had substantially reduced their planting area once they had increased yields using the project-promoted agronomic practices.

Soil Conservation Without Subsidies: Vermont Partners Approach

The AID Funded Sabanagrande project operated by the Vermont Partners of the American is focused on a much smaller geographic area than the NRMP. It has been successful in promoting the widespread installation of soil

conservation structures without the use of subsidies. Persons associated with the Sabanagrande project indicated that they had experienced few problems getting farmers to construct soil conservation works without subsidies once the value of such an investment is accepted. Field inspection in the La Ceiba area of Sabanagrande suggested that there was indeed a high degree of participation in soil conservation works among the local farmers.

However, the soil conservation structures constructed in the Sabanagrande project are much smaller than those constructed by the NRMP, and the two types of structures are not properly comparable. The two approaches to soil conservation should be compared in the field taking into consideration durability and maintenance, productivity enhancement, erosion reduction and overall labor input.

Comparison of Subsidized vs. Unsubsidized Conservation

Advantages and Disadvantages of Subsidies. There are several advantages offered by subsidies:

1. They can be useful in convincing farmers to undertake new practices, such as soil conservation, which involve a substantial effort or expenditure and which, of themselves, do not produce an immediate and viable increase in income. Precisely for this reason the soil conservation practices which are promoted in both the NRMP and the Vermont Partners projects

are combined with production-increasing agronomic techniques so that an immediate gain in productivity will be associated with the soil conservation works.

2. Subsidies can also be useful in convincing farmers to undertake permanent improvements on land which they farm but to which they do not have clear title. This is an issue of some importance, since most of the small farmers do not have clear and undisputable title to the lands they use, or may have a tradition of using lands belonging to a large landowner on a rental basis.
3. Subsidies to cooperating farmers in compensation for undertaking risky practices can provide a less expensive and generally more effective means of funding experiments and demonstrations than the alternative of setting up an experiment station with its costly infrastructure and staff. Similarly, subsidies can be used to accomplish conservation measures of benefit to a community, downstream water users or future generations as an alternative to more expensive public works expenditures. Measures to promote the recovery of badly degraded lands and stream courses are good examples.
4. In certain parts of the Choluteca watershed, particularly in the south, subsidies have the function of providing an alternative income/food source for farmers who would otherwise work as migrant laborers in cotton and coffee rather than improve their

land. Once conservation measures have been installed, then yield improvement provides the option of staying on the land rather than working off the farm. This quality of life improvement can be permanent.

5. The use of subsidies provides the project personnel with an effective control over the quality of the structures which are constructed since payment of subsidies can be withheld if construction standards are not met. In the absence of subsidies quality control would be persuasive rather than coercive.

Offsetting these advantages there are a number of disadvantages to the use of subsidies:

1. Sustainability is diminished. The tendency for soil conservation activities to become associated with subsidies rather than the soil conservation benefits themselves can tend to weaken the incentive to continue conservation efforts once subsidies are eliminated. Soil conservation structures must be maintained to achieve long-term benefit, particularly if cattle are allowed to graze crop residue or rotations in protected areas. If the soil conservation structures were promoted on the basis of the subsidy rather than their long-term benefit, the farmer will have little incentive to maintain them and their benefit will be lost.

2. Institutional development is thwarted. Subsidies are costly, and the financial resources of the local government will probably be inadequate to support a soil conservation program based on subsidies. As a result, soil conservation activities can become irrevocably tied to foreign aid and this can thwart the development of local institutional responsibility for resource conservation.

3. The focus of extension can become misdirected. The availability of subsidies can serve as a crutch for extensionists because it may be easier to promote the subsidies than the benefits of the soil conservation activities. In the absence of good supervision (which is not always available) extension agents can fall into the pattern of becoming "give-away" agents rather than agents of technology transfer. In defense of extensionists, it is also necessary to point out that while the imposition of goals or quotas is necessary to orient field activities toward achievement of tangible results, it makes the use of incentives or subsidies a very attractive mechanism for keeping project administrators happy with a steady stream of "results in the field". There is a tendency among governments and development assistance agencies to measure project success in terms of tangible, generally structural accomplishments. Pressure to achieve visibly impressive results helps to justify subsidies and obscures important, but more subtle, achievements.

4. Creation of dependency among beneficiaries. Unfortunately, subsidies tend to foster a dependency relationship rather than the creation of an attitude of self-reliance. The reinforcement of a dependency relationship over a period of years, or generations, can only have a debilitating effect on a population's initiative and make true development increasingly difficult, if not impossible.
5. The multiplier effect may be diminished. If subsidies are available to only a segment of the population, or a fraction of the target area, farmers may postpone improvements in other neighboring areas until subsidies are again available.

Sustainability of Soil Conservation Practices

The issue of sustainability is so difficult to assess at this time that any analysis will be merely conjectural; most structures have been only recently constructed and do not yet require significant repair effort. Under this circumstance a valid assessment of sustainability is impossible.

However, field interviews revealed that 84 percent of the farmers had built some form of conservation structures and 76 percent of those having soil conservation structures indicated that they had already seen yield increases. Most frequently they cited the visible reduction in rill erosion. That these benefits have already been observed suggests that the structures will be maintained.

Soil Conservation Subsidies: Conclusions and Recommendations

Due to the potential abuses and pitfalls which are associated with the use of subsidies to promote soil conservation, subsidies should be used sparingly and with the utmost of caution. Most appropriate are subsidies which promote community benefit, including downstream beneficiaries.

Examples include:

1. Maintenance of stream corridors through protection to allow revegetation and provision of off-stream sources of stock water.
2. Protection and revegetation of areas found to be prime sources of downstream sedimentation.
3. Reestablishment of cloud forest areas because of their contribution to water supplies. Planting of communal lands and reforestation of public lands.
4. Construction of small check dams and other structures in streams and gullies to reduce erosion (combined with corridor and upper watershed protection).

Subsidies may be indicated when careful assessments indicates that benefits outweigh the disadvantages. Subsidies to private landowners may be justified when relocation is not possible and downstream benefits justify payments to assure erosion reduction measures are applied. Otherwise funds can be better used to educate and promote economically beneficial soil and moisture conservation.

C. RURAL DEVELOPMENT EXTENSION

Overview of Campesino Extension Needs

Many of the problems of agricultural extension in developing areas, Honduras included, derive from their application of the U.S. extension service model. Extension agents in the U.S. are trained for the most part in the large Land Grant universities located in each state. These Land Grant universities receive massive funding for agricultural research, training and extension from the state and federal government as well as from agribusiness and producer's associations. The U.S. extension agent works primarily within a familiar socioeconomic framework of commercial farmers, not with semi-literate peasants of a different culture and social class. The U.S. system of extension has not been notably successful in working with small farmers, particularly minority farmers. Since all farmers constitute only about 4% of the U.S. population, this is not a particularly noticeable problem. Farmers in the U.S who cannot make a full-time living off agriculture have a wide variety of alternative employment options, either part or full-time. In fact, most "farmers" in the U.S. augment their agricultural earnings with income from another segment of the economy. Unlike the U.S., in Honduras, the campesino farmers constitute the MAJORITY of the population and enjoy vastly fewer employment alternatives than their agrarian counterparts in the U.S.

In many respects the agricultural support system that does exist in Honduras replicates the U.S. model; agricultural research, training and extension is focused on technology appropriate to commercial enterprises (eg. mechanization, dependence on chemicals, monocropping and related aspects of commercial agriculture). Little if any training is offered in topics such as animal traction, intercropping, use of organic fertilizers, small scale food storage, and other technologies appropriate to campesino farmers.

Furthermore, there appears to be no prospect of absorbing the rapidly growing campesino population into other sectors of the economy, and there will be at least as many campesinos in the future as there are today. The Honduran campesino farmer will not gradually disappear as in the U.S. Rather, these small hillside farmers will continue to produce the majority of the basic foods while earning a minimal income. Their impact on the soil and water resources that support not only them, but also the rest of the population, will continue to grow in seriousness.

A growing and impoverished campesino population not only represents a potential drain on the nation's economy, a squandering of human resource potential and a threat to environmental integrity; it can also provide the basis for future political instability. The development and implementation of an effective extension model for campesino farms will be a key determinant of the rate and direction of national development.

Key Components of Campesino-Oriented Extension

What is the purpose of campesino-oriented extension? Basically, we feel that its primary purpose should be three-fold: (a) enable the campesino family to produce and store enough food, particularly basic grains, to meet its dietary requirements; (b) aid the campesino family to develop and implement income-generating activities, most probably oriented toward crop diversification and local cottage industries; and (c) assist the campesino to acquire skills and implement technologies appropriate to his environment which will result in an improved standard of living. These activities should be undertaken in a fashion which does not create a dependency on extensionists, but which will permit and encourage the farmer to undertake and maintain these activities in a self-sustaining manner.

Three extension concepts of particular importance in promoting agricultural development on campesino farms in Honduras are:

1. Human resource development to achieve sustainable results.
Successful extension is measured not solely by the number of meters of terraces built and fields plowed on the contour. The full measure of success is the physical change in land use accompanied by a full understanding of the intrinsic merit of the change. The change should reflect a new willingness to ability to access private and government sources of new

technology without direct pressure from an extensionist or subsidy. Emphasis in extension should be on promoting self-reliance and self-motivation. It is most important to change attitudes and perspectives; new attitudes are fundamental to development.

2. Promote technology appropriate to the campesino farm system.

The campesino farm is an environment largely devoid of advanced technology and is likely to remain so for the foreseeable future. It is necessary to undertake research and training activities to support the development and implementation of technologies appropriate to campesino farms, in the same fashion that research and training activities have traditionally been focused on commercial farming as best exemplified by Zamorano.

Campesino technology must be oriented toward an integrated approach to farmstead management rather than the more specialized approach typical of commercial enterprises. A campesino will simultaneously conduct activities in small grains, vegetables or tree crops, both large and small animals, forestry or agro-forestry, soil conservation, fertilizer production, marketing and one or more cottage industries. Extension must focus on technologies which successfully integrate these many activities, and must avoid excessive

specialization in one area at the expense of others.

3. Support the productive role of women. In Honduras the success of the small family farm often depends on the direct participation of women in agricultural activities. There is also a relatively high incidence of women as the primary producers on the farmstead. Women play important income-generating roles such as selling eggs, vegetable gardens, baking and cottage industries. Though the importance of their income contribution to the annual family budget is frequently disguised because it accrues from small (but regular) earnings, in many cases the income earned by women in these "small projects" constitutes the family's principal source of cash.

Significant Accomplishments of the NRMP Extension Program

The NRMP represents an invaluable and important step in the development and demonstration of extension services which are effective in reaching Honduran campesinos. Specific accomplishments include:

1. Identification and demonstration of major components of a technical assistance package oriented to hillside farmers (e.g., soil conservation, organic fertilizers, minimum tillage, planting techniques, seed selection, agro-forestry, pasture production, improved stove technology).

2. Incorporation of women into the extension process and re-orientation of extension programs for women toward productive enterprises.
3. Support and expansion of para-technical campesinos ("Productores de Enlace") as an integral component of the extension package (in the Southern Region). The training program for para-technical campesinos has also been strengthened. It is important to note that the "Productores de Enlace" program was initiated by the Ministry itself before the NRMP began field activities, and this represents an important Ministry initiative which has been greatly reinforced by the project.
4. Demonstration plots have been used effectively to provide convincing evidence of the benefits which can be achieved using improved agronomic and soil conservation practices.
5. Training materials have been developed to enable extension agents to be re-trained with technologies appropriate for the campesino environment, and over 150 extension agents have received both training and field experience in campesino areas.

In summary, the NRMP has been successful in establishing within its project area an extension system which is oriented toward the needs of campesino farmers. Furthermore, the fact that this has been accomplished as an adjunct to existing extension programs in the Ministry of Natural Resources enhances the opportunity for the eventual incorporation of this

approach into the Ministry's permanent extension effort.

Constraints

1. Social distance. Significant social differences separate extensionists from their campesino clients. Some extensionists, and in some cases entire agencies, have dealt effectively with this problem and are able to relate effectively with the campesinos they serve. However, some extensionists convey the impression that: (1) working with campesinos is far beneath their professional aspirations but it was the only job available at the moment; (2) they are bored and frustrated with the campesino environment; (3) living conditions are unbearable; and (4) working conditions are little better than living conditions, etc. Most extensionists live in their work area during the week but seek refuge elsewhere on weekends. Some extensionists are able to commute daily.

The observations are not being made to disparage the extension agents, their selection process or the efforts of NRMP administrators to overcome these problems. Rather, it is a simple fact of life that most non-campesinos have a real difficulty adjusting to the rural campesino environment. Surely, few (if any) of the people who read this report would be able or inclined to do better than these extensionists.

The problem of a real and unavoidable social distance between campesinos and most technical school or university graduates is probably the most difficult constraint which plagues efforts to deliver effective extension services to campesinos.

2. **Over-specialization.** Extensionists tend to work within their own areas of expertise (eg., soil conservation, agronomy, forestry, livestock) rather than being trained in a more generalized "small farm system" approach. Some of the problems which this has created are outlined below:
 - (a) There is a poor distribution of workload among the extensionists within each of the extension agencies, since some areas (eg. agronomy) typically entail a greater number of clients than others (eg. forestry or livestock).
 - (b) Record-keeping is being maintained separately for each activity (eg. agronomy, forestry, soil conservation) rather than establishing a single record for each farm. This tends to inhibit the development of a synthesized farm system approach and also creates reporting problem (eg. If one manzana of land is improved using soil conservation techniques, and then trees are planted alongside the rock walls, then the acreage treated may be reported twice, once for soil conservation and again for agro-forestry. NRMF personnel estimate that about half the reported agro-forestry activities actually represent double-counting since they are combined with soil conservation

activities).

(c) The cost of extension activities is increased and effectiveness is decreased, because each farmer must deal with several agents for different activities on the same small farm. Overall, specialization tends to defeat the goal of developing a small farm "system" and makes extension work more complicated and costly than warranted.

3. Inflexibility of work plans. Work plans are excessively rigid and appear to lack the flexibility required to permit extensionists to respond to the individualized needs of their particular agency or clientele. This problem may reflect an inflexible middle management attitude rather than a problem with the work plans themselves, since it is easier to follow pre-established plans than to invest the additional effort required to service specialized requests (eg. obtain special seed or materials).
4. Sustainability. Reliance on leadership (extensionists) from outside the campesino community, as opposed to the training and development of leaders and innovators within the community, tends to limit the program's positive impact on reinforcing community confidence and their ability to plan and implement development activities. The "Productores de Enlace" program is an important but incomplete step toward the resolution of this problem.
5. Inadequate Technical Support. Technical support is provided to field personnel infrequently and there is inadequate field checking

and evaluation of the quality of interventions by the project technical staff. Inputs such as seeds occasionally arrive late causing demonstrations to be postponed an entire growing season, and the centralization of purchasing and lack of a petty cash fund creates long delays (several months in some cases) for the purchase of even simple items.

Recommendations

1. Focus on use of campesinos trained as para-technicians as extension field agents. While the NRMP has made tremendous progress in the development and implementation of an extension model targeting the campesino farmer, we feel that the NRMP now needs to seriously re-think the entire concept of campesino extension and the manner in which it can be expanded to serve a much larger population in the light of the field experience gained to date. The following discussion and recommendations are being made to help focus this re-evaluation and re-structuring process.

Campesino extension is a costly undertaking. Campesinos are more numerous than any other farmer group, their low level of literacy inhibits the widespread use of printed matter, rural transportation is both time-consuming and hard on vehicles, etc. For example, the NRMP has spent approximately \$4.6 million to date on watershed

management activities (Project Office plus TA expenditures) and has reached nearly 3500 campesinos. This result in an average cost per campesino of nearly \$1,500 to date. Many of these costs are initial project costs for equipment, training and technical assistance that will tend to be amortized over time. Against these costs various benefits have been identified in Chapter VII. Such benefits do not accrue to government which must pay back Project loans. Therefore it is important to greatly increase para-technical involvement, thus reducing salary, vehicle and other overhead costs per campesino served.

This problem of high cost must be explicitly considered in program design, particularly for programs designed for eventual incorporation into a budget-constrained national institution.

The long term budgetary constraints faced by the GOH, combined with the possibility for considerable inputs of external financing in the short run, suggests that a two stage extension approach may be appropriate:

- (a) Stage 1. An extensive effort aimed at bringing campesino farmers up to to some "threshold" level of production technology and skill in accessing government and private sources of technology, financing, specialized inputs, etc.

First stage activities would emphasize extensive field effort and person-to-person contact with essentially every campesino in the target area. Field extension agents would typically be campesinos trained as para-technicians working full-time for a salary. This represents a direct expansion of the "Productor de Enlace" approach. Field agents would initially be trained as generalists in small farm systems rather than as specialists. Training, supervision and technical support for the para-technical campesinos would be provided by trained agronomists, foresters and other professionals.

These activities would be funded through the current NRMP and follow-up programs (eg. Phase II of the NRMP).

- (b) Stage 2. A maintenance effort oriented toward providing support services to campesinos on an "as requested" basis.

A reduced staff of extension agents would provide liason between campesinos and the research and related activities of private and governmental institutions. Each field agent would be trained in a specialty field to supplement his general knowledge. This specialization would be initiated during Stage 1 and reinforced during Stage 2. Since the first stage activities are designed for limited duration, as they terminate only the best field agents would be requested to continue employment during Stage 2. As in Stage 1,

training, supervision and technical support for the para-technical campesinos would be provided by trained agronomists, foresters and other professionals.

These activities would be supported largely through Ministry of Natural Resources infrastructure, with the possibility of limited external financing for specific projects.

We feel that the best manner to simultaneously address the various constraints which inhibit the impact of extension on campesinos is to focus away from the use of trained agronomists as field extensionists, and in their place to use trained para-technical campesinos. Trained agronomists will be more effectively utilized in technical support and supervisory roles rather than as field extension agents in the campesino environment.

By using salaried, para-technical campesinos it is possible to avoid the very real and difficult problem of large social class differences between extension agents and campesino farmers which inhibits the effectiveness of trained agronomists (or other professionals) within the campesino community. Ideally the para-technical campesinos would work in or near their local communities, thereby enabling them to make their rounds largely on foot or motorcycle. This not only reduces project expenditure on vehicles, but also

encourages a more complete coverage of each extension area.

Although agronomists have much more training and scientific knowledge than campesino para-technicians, much of this knowledge (eg. mechanization) is not merely useless in many campesino environments, but may actually be counter-productive since it represents an orientation which must be un-learned. Conversely, trained agronomists typically lack education in areas of importance to hillside farming (eg. organic fertilizers, soil conservation, animal traction, agro-forestry) and must be re-trained by the project. As a result, it can be argued that the use of trained agronomists represents a more costly yet less effective approach to extension than the use of campesino para-professionais.

It also merits mention that the use of local campesinos should reduce the problem of turnover among extension personnel. An extension job in a campesino area is generally not considered a desirable job for a trained agronomist, and it is most likely that these positions will be held by junior agronomists for 1 to 3 years before moving into a more desirable job position. While this field experience is undoubtedly beneficial to the agronomist and society as a whole, rapid turnover thwarts effective extension to the campesinos who are the targeted beneficiaries. A number of problems in the NRMP project have been associated with the high rate of turnover or

re-assignment of field personnel and any arrangement which would mitigate this problem would be highly beneficial.

The program of "Productores de Enlace" is a good start in this direction, but at its present stage of development remains inadequate because it retains an element of heavy dependence on the trained agronomist. This tends to inhibit the development of a complete range of skills by the para-technical. Also, since the "Productores de Enlace" are all volunteers, it will not be possible to utilize them on anything even approaching a full-time basis. Therefore the project does not obtain the full benefit of the expense of their training, and the outreach capacity of the most highly capable individuals will be limited to the amount of time they are willing to volunteer.

Results achieved to date with salaried para-technicians has been good. The Vermont Partners Project uses paid para-technical campesinos with good results, although at pay rates not considered sustainable without international funding. The Tatumbula Office of the NRMP has a salaried campesino para-technician who is considered to be an outstanding asset. Of course, proper selection, training, motivation and supervision are keys to the achievement of favorable results and must be an integral program component.

Salary levels of para-technicians should probably be related to local wage scales (eg. L.5/day in the Choluteca area, when work is available) rather than those in Tegucigalpa. The pay for a para-technical employee should probably be around twice the local wage scale. This will provide adequate income to hire labor to work his own farm plus provide additional incentive income.

2. Give increased emphasis to alternative methods to support technology dissemination. Greater use of alternative methods of technology dissemination could be incorporated into NRMP activities such as:
 - (a) Posters and other visual aids geared toward a semi-literate population could be developed and distributed to reinforce the basic concepts being promoted by extension agents.
 - (b) The use of radio broadcasts should continue to be supported. Although these alternative methods can support the extensionist, they can never replace person-to-person contact.

3. Provide technical support and extension services in the area of marketing. The increased production of vegetables and other income-producing crops which is being encouraged by the project holds the potential to create an over-supply with resultant decreases in prices which can counteract efforts to increase farm income.

A marketing component needs to be added to the project, or alternatively the project should establish a close and effective liason with a separtately-funded marketing program.

4. Restructure the project organization to permit closer coordination between field agents and technical staff. As presently organized there is no formal mechanism for project technical support staff to interact directly with the field agencies; the formal communication pathways pass through a minimum of two sets of supervisors, and informal mechanisms have not been particularly effective within the highly structured context of administrative and planning responsibilities. Field personnel as well as technical staff are frustrated by this situation. The supervisor positions have been seen frequently as "bottlenecks" rather than "facilitators."

Better coordination and increased contact is required for technical personnel to evaluate the quality of the field interventions and to provide technical advice, to assist in the acquisition of specialized inputs (such as new plant varieties), etc. However, these requests should be limited to "emergency" situations and specialized inputs.

It is recommended that the supervisor of each agency be authorized to make contact directly with the technical staff to request

specialized inputs and assistance. Additionally, technical staff should be required to make semi-annual or annual inspections and evaluations of the quality of the field work in each agency.

5. Training and evaluation. The problem of over-specialization should be countered by adopting a farming-system approach in the training activities. The following areas should be included in the training process:

- (a) Generalized extension in appropriate farmstead technologies;
- (b) Methods for outlining a comprehensive farm plan;
- (c) In the case of non-campesinos, orientation in the social and cultural characteristics of the campesino environment.

As an additional measure, an in-service training period of three months should be required of all new extension agents. Under no circumstance should a new agency be staffed with new, inexperienced personnel.

A system for evaluating the job performance of extensionists is desirable. If extension agents do not meet performance requirements their service should be terminated. Conversely, efforts should be made to establish a merit plan based either on salary increases or non-salary benefits and special recognition. It should be stressed that merit should not be based solely on the basis of meeting quotas ("metas"), but must include an assessment of work quality as well. Review of farm plans

and goals attained should be an integral part of the evaluation/merit process.

Planning and priorities. The planning and execution of the project needs to be more responsive to the individualized needs of each agency, plus the unforeseen situations which can arise. As planning operates at present, initiative is not encouraged at the agency level and in some instances has been stifled. Plans should expressly make provision for changes or "adjustments" during the year to cater to the individual needs of agencies and their clients.

D. PROMOTION OF DEMOCRATIC INSTITUTIONS

One of the goals of the NRMP is to strengthen and support institutions and workstyles which will reinforce participatory democracy. This goal can be attained by means such as leadership development among campesinos, the encouragement of participatory decision-making, the teaching of creative and effective ways to acquire needed services without paternalistic intervention, and the fomenting of individual and group initiative. The evaluation team was cognizant of efforts to attain these goals and observed both strengths and weaknesses of the project in this regard.

Significant Accomplishments

Campesinos receiving assistance from the project seemed pleased that the national government was working in rural areas and concerned for their welfare. For many, simply having an extension agent visit them in their homes was an unusual and gratifying experience.

The project has successfully reconstituted various defunct organizations of men and women in the countryside (church groups, CARITAS groups, or old Recursion groups). By building on pre-existing structures the extension personnel have moved ahead rapidly in the formation of democratically constituted voluntary associations.

Extension agents readily work with individuals not interested in becoming members of formal men's or women's groups. This egalitarianism in project work ethic has convinced campesinos that the government (project) is not catering to special interest groups nor the well-to-do.

The fledgling productor-de-enlace (local para-technician) program in the South is admirable in that it includes the campesino as an agent of change and brings the program directly within the expertise of local leaders. The campesino is therefore given greater leverage over those policies and events that will shape his life.

The establishment of agricultural committees, cooperatives, and other formal organizations is developing leadership skills among campesinos and participatory decision-making.

Constraints

Despite these accomplishments, the evaluation team was disturbed by repeated indications of a lack of flexibility in adapting plans to the particular needs of the individual field agencies and the discouraging of initiatives. The project itself does not fully embrace a management style conducive to the reinforcement of democratic principles. On one hand we recognize that the preparation and adherence to annual plans has been essential to the project and has contributed to the many successful work efforts achieved thus far. Nonetheless, the planning effort, and

execution of plans, appears to be oriented toward a top-down management style that discourages an open, innovative, and democratic work situation. Part of the problem lies in the project's current organizational structure which requires all administrative and technical issues to pass through two field supervisors, without alternative pathways for individual agencies to obtain technical assistance.

Recommendations

Broader participation of field personnel in the planning as well as implementation of project initiatives needs to be emphasized.

To discourage the paternalistic tendency of the project to be a service provider rather than facilitator, greater participation of campesinos in project management should be encouraged by emphasizing the producer-de-enlace concept. The producer-de-enlace should be an individual operative and not a field assistant to the extensionist.

The great difference in social class, values, and attitudes between campesinos and extensionists frequently leads to ethnocentrism on the part of the extension agent. For example, some extension agents wrongly assume that intelligence is linked to literacy, that campesino customs and traditions are worthless or at best archaic, and that campesinos are child-like and should be treated accordingly. Many extensionists are unaware that technical accomplishments and education do

not denote social superiority.

The selection process of field personnel should include some means of determining applicants' attitudes toward campesinos; their aptitude for working with people vastly different from themselves; and their ability to work with technologically unsophisticated people without displaying arrogance or paternalism. In addition, all field personnel should receive orientation in the culture of the campesino to heighten sensitivity to these issues. As a result of these approaches, the democratic principles of equality and intrinsic worth of the individual will be better served.

E. INTER-AGENCY COORDINATION

Significant Accomplishments

The NRMP began in 1980 as a separate "special" project attached to the Ministry of Natural Resources. As a result of the efforts by the project director and the positive results which were being achieved in the field, beginning in February 1985 the NRMP has been incorporated into the institutional framework of the Ministry's program as the Regional Office ("Direccion Regional") representing the Ministry in two of the 11 Ministry regions where project activities are focused. In this capacity, the NRMP coordinates the various services available through the Ministry in the areas of project focus.

Through its field extension efforts, the NRMP is coordinating the delivery of services from a variety of national and external resources to campesinos. Examples include coordination with CARE and COHAAT to administer food-for-work donations as incentives for construction of soil conservation structures, coordination with SANAA in the preparation of the water sampling plan for the Guacerique watershed (equipment already purchased, field activity to begin in mid-1986), preparation and execution of inter-agency agreements with COHDEFOR, coordination with the AID-sponsored "Rural Roads" project to improve access in some project areas, etc.

Constraints

Despite these significant accomplishments, there are several crucial areas where additional emphasis must be given to coordination in order to have a more significant impact on watersheds. It is also possible that important gains which have been made will be frustrated by the changes in personnel throughout the government which is occurring as this evaluation is being written due to the change in government.

Recommendations

Priority areas for increased coordination effort are outlined below. Resolution of these issues are necessary to maximize project impact on resource conservation and income-generation for campesinos.

1. Establish a joint NRMP-COHDEFOR commission to develop Forest Master Plans and standardized Forest Management Plans, as discussed in more detail in the section titled "Forest Management." Forests account for over 50 percent of the land area in the Choluteca watershed, and the existing legal/institutional system makes it impossible to manage these resources in a rational manner in the absence of COHDEFOR-approved management plans.
2. Greatly increased emphasis should be given to establishing and utilizing the variety of inputs available through the private, national, and international sources. The NRMP is too inwardly focused, and could benefit greatly from increased access to

technical and other resources such as: genetic materials from the Pan American School at Zamorano; appropriate technology equipment, ideas and techniques available through the AID-sponsored "Rural Technologies" project and various PVOs; national and international sources for improved seeds, including private sources.

VI. WATERSHED MANAGEMENT

A. FOREST MANAGEMENT

In the initial phase of the project, forest management activities focused on establishment of pure stand plantations with subsidies being offered for tree planting plus additional subsidy payments for each tree surviving to ages of 1, 2, and 3 years.

Experience suggested that pure stands were planted more for subsidy payments than any other reason, and that farmers were truly more interested in activities falling into the broad category of agroforestry. Another important constraint inhibiting the more widespread planting of pure stand forests is the problem of land tenure; most farmers have small holdings with inadequate space for pure stand plantings, plus many lands are untitled which means that a person planting trees has no clear right to their eventual use.

Due to these constraints the emphasis on pure stand forest management has declined over time and the emphasis on agroforestry has increased.

Despite decreasing emphasis within the project, forestry activities are very important as over 50 percent of the land in the watershed is dedicated, not to agriculture or agroforestry activities, but to forestry proper. There exists a very real need to develop a sound and sustainable forestry component to address the management needs of the forested lands.

Significant Accomplishments

The project has made significant progress toward establishing inter-institutional agreements with COHDEFOR which provide incentives to landowners establishing forest plantations on their properties (Convenio COHDEFOR-Recursos Naturales, 13 August 1982. Convenio de Plantacion, Recursos Naturales-COHDEFOR-Proyecto. Constancia de Extencion, Recursos Naturales-COHDEFOR-Proyecto).

Procedures applied to thin and extract firewood from natural stands have ensured the retention of tree cover on properties to which technical assistance has been given in forest management. This is a positive factor in watershed protection.

By encouraging and assisting thinning and pruning in stands of pine and oak, the project has taken significant steps towards demonstrating the economic and social viability of small-scale forestry production and two-tier land management (e.g., forest above pasture or forest above agriculture).

Constraints

Under present law all trees in natural stands or naturally regenerated stands, be they on private or public property, are considered a public resource. In the absence of an approved Forest Management Plan, concessions to harvest these stands are granted by COHDEFOR without

consent of the landowner (Decreto Ley 85 and 103). While in theory this should encourage tree planting, in practice this has not occurred. It does, however, constitute an impediment to management for natural regeneration. Campesinos lack the expertise to prepare Forest Management Plans, and lack the economic wherewithall to hire such expertise.

COHDEFOR regulations will grant permits for fuel wood extraction without the preparation of a Forest Management Plan, although a tax is levied according to the volume permitted. In an effort to improve the management of forests which are affected by fuel wood harvest, through an agreement with COHDEFOR the project is providing technical assistance to fuel wood extractor's, and in exchange for compliance with the project's technical guidelines the extractor is granted a temporary exemption from COHDEFOR extraction tax. However, there is no mechanism to support the continuance of these management practices once the tax holiday expires.

One disadvantage of management directed towards fuel wood production is the removal of all trees regardless of alternative commercial uses, thus precluding the production of saw timber and preventing the forest from realizing its full potential as a national resource. Because stand improvement practices such as prescribed burning are not required of fuel wood harvesters, this encourages both the excessive accumulation of combustible litter as well as excessive competition from broadleaf species. This not only degrades the commercial potential of the stand,

but it also makes the forest increasingly susceptible to severe damage or destruction by fire.

An essential step toward the solution of this problem is the preparation of Forest Management Plans which, once approved, establish the right to extract saw timber as well as fuel wood, and outline compulsory management practices (thinning standards, prescribed burning, etc.) oriented toward stand improvement. Project activities which could be undertaken to support the preparation of Forest Management Plans are outlined in the subsequent section on "Recommendations."

Inspection of stands managed under the technical guidance of the NRMP indicate that inadequate attention has been given to the removal of deformed and defective stems and the thinning of non-commercial species within naturally regenerated stands.

In a number of communities (e.g., Tatumbla) the forest standing on public lands (terrenos ejidales and terrenos comunales) is being depleted and degraded by uncontrolled cutting, over-grazing and the burning of pasture. Control of this problem is unfeasible under existing institutional arrangements due to the lack of enforcement by CONDEFOR and the absence of a mandate enabling the project to undertake management activities on these forested lands.

Recommendations

1. Legal and institutional constraints are prime factors which impede the more rational development and utilization of natural forests. Two basic activities are recommended:
 - (a) Forest Master Plans should be prepared for each subwatershed by a joint CONDEFOR-NRMP commission. These Master Plans should outline the basic forest management strategies appropriate for each zone in the subwatershed and define the requirements and format for detailed Forest Management Plans. It is suggested that the first such Forest Master Plan be prepared in the Yeguase River subwatershed in conjunction with the Pan American Agricultural School in Zamorano.
 - (b) The project should provide technical assistance for the preparation of detailed Forest Management Plans that comply with the guidelines established in the Forest Management Plans for the respective subwatershed. It is suggested that as a pilot project the first Forest Management Plan of this type be prepared for the Uyuca Forest Reserve in conjunction with the Pan American Agricultural School at Zamorano, and in the adjacent Tatumbla area.
2. Initial project efforts to establish pure plantations most often displaced agricultural and rangeland activities. Plantation activity, which was greatly reduced by the project during 1985, should be re-oriented to planting protection forests only where

serious soil erosion problems exist and comparable benefits cannot be achieved through protection of areas to permit revegetation.

Because the Forest Management Plans for small holdings will be rather simple and straightforward, a standardized Forest Management Plan format (standardized mimeo sheet) should be adopted in conjunction with COHDEFOR to simplify both administrative and technical requirements.

B. AGRO-FORESTRY

Significant Accomplishments

During the past year (1985) it has been recognized that trees are an important component of the technical assistance package for campesinos. Non-fruit trees have been integrated into soil conservation, range management, and other farmstead development activities to achieve the following benefits:

1. Trees serve as a source of green manure. The organic matter contributed by their leaves constitutes an important source of organic material for composting ("aboneras") and soil conditions, and woody legumes fix nitrogen in the soil.
2. Woody legumes can be incorporated into range management practices by using them to supplement forage production during the dry season and as "protein banks" (a source of protein-rich forage to be grazed on a limited basis to supplement low-protein grasses).
3. Harvested stems provide fuel wood, posts, and building materials.

One of the principal advantages offered by agro-forestry is that the trees can be incorporated into small farmsteads as living fenceposts, vegetative barriers, windbreaks, etc., thereby making full "two-tier" utilization of limited land resources.

The project has clearly demonstrated that trees can be planted to produce recognizable benefits for small farmers, other than traditional plantations or as dooryard ornamentals that will never be harvested.

Specific accomplishments include:

1. Planting of 407,000 multipurpose trees on 1,148 small hillside farms for fuel wood, forage and soil conservation benefits. Interviews suggest a survival rate of about 70 percent. This agro-forestry effort represents 60 percent of the 1985 forestry planting effort, as opposed to only 16 percent of the 1984 planting effort.
2. Results from field demonstrations indicate that 20 trees of Lucaena, 2 1/2 years old, produce 800 kg of biomass. This translates into 600 kg of dry weight firewood equivalent, sufficient to supply a family for 4 months.

Constraints

The best genetic material available has not always been used. For example, plantings of poorly formed eucalyptus in the Cabeceras area is most probably due to the use of poor quality genetic material.

While tremendous numbers of agro-forestry trees have been planted, it is not clear that adequate orientation is being given on the best way to harvest and utilize the trees.

To date there has been relatively little interaction between the resources of the Pan American Agricultural School at Zamorano and the NRMP. In particular, Zamorano has species collections which could increase the diversity of genetic material available to the project.

Recommendations

1. On-farm management techniques must be stressed to insure the farmer knows how to best utilize trees to maximize the production of green manure, forage, or fuel wood.
2. Species selection should be expanded to include more useful multi-purpose species, in particular for the Cabeceras area.
3. Obtain and utilize only the best and most appropriate genetic material available (e.g., improved Eucalyptus and Leucaena varieties). Seed for species such as Eucalyptus that are susceptible to genetic degradation through hybridization should be purchased as certified seed from reliable sources.
4. Forest research efforts at the Pan American Agricultural School at Zamorano should be expanded to provide a basis for expanding the species being used in the project by expanding species trials, particularly with multi-purpose legumes.

As part of this program it is recommended that Zamorano acquire the CIAT germplasm bank for promising Leucaena spp. and other legume species for forage production and soil conservation. Priority should

be given to native species, but promising exotics should not be discounted.

5. Support applied agro-forestry research for development of appropriate technology for hillside farms. On-farm trials should be established and monitored using existing NRMP infrastructure. Activities should include: (a) evaluating a wider variety of legume tree species, (b) improved forage production based on use of legume forage during the dry season, and (c) evaluation of fast-growing fuel wood species.

Two tangible end products developed as a result of these on-farm trials. Brief research reports should summarize results of trials and a silvicultural manual should synthesize species attributes and restrictions under distinct agro-forestry practices and climatic zones.

Best results would be achieved if short-term technical assistance were contracted for helping to design and develop farm trials, and to subsequently evaluate and synthesize results.

A small field team of national professionals will be required to establish and monitor field trials and analyze results. This team should be multi-disciplinary and work within the farming systems approach to agro-forestry. They should work with both trees and legume cover crops.

6. Centralized nurseries, initially organized for large scale plantations, have started to be decentralized toward small field nurseries organized by local groups of farmers. This practice should be encouraged, particularly where agro-forestry practices are to be used.
7. Where appropriate, seed collection should be encouraged by local groups for *Leucaena*, *Gliricidia* and other species found locally that are going to be planted by direct seeding. This would capacitate farmers so that if the technology proves to be appropriate they would be able to continue this practice without project assistance. The use of subsidies may be appropriate to support this activity.
8. The technical support coordinator position for the South (Cholulteca) should be supported and strengthened so as to be able to quantify and further document project results. Quality of work should be emphasized more than quantity. Annual goals should be measured in terms of field results (tree survival), not the number of trees produced in nurseries or delivered to farmers.

C. PASTURE AND RANGE IMPROVEMENT

Significant Accomplishments

Many small farmers own livestock (primarily cattle, horses, mules, and oxen). Cattle represent a source of milk and a form of saving for major purchases or emergencies.

One of the principal objectives of pasture improvement is to provide adequate supplies of forage during the 5-month dry season, thereby reducing grazing pressure on over-grazed land with attendant soil conservation benefits as well as prolonging milk production and increasing weight gain.

Efforts to improve livestock production have focused in three principal areas:

1. Use of forage producing species (grasses and woody legumes) planted as living fences, living barriers in soil conservation works, and similar live-planting situations.
2. Planting of cut-and-carry chopped forage ("pasto de corte") on individual farms or commercial plots.
3. Planting of improved pasture, generally using credit. This activity has been implemented on a limited scale with only a few farmers having an "excess" of lands; it is not applicable to most small farmers. The species most frequently used is African star grass.

The major emphasis of the livestock program within the NRMP has been focused on the use of credit to improve pasture and infrastructure.

At the end of 1985, a total of 210,000 Lempiras had been loaned to 63 farmers, who had made the following pasture improvements:

	<u>Mz</u>
Planting of improved grasses	531
Weed control	<u>688</u>
	1,219

Livestock specialists in the NRMP central office estimated that some type of technical assistance had been offered to perhaps 400 to 500 farmers without credit. Field interviews revealed that the most common type of livestock/pasture improvement undertaken by farmers without credit was the planting of cut-and-carry forage (usually king grass), typically in conjunction with soil conservation structures. Several farmers both with and without credit, had planted king grass as a pure stand of cut-and-carry forage. Leucaena was also planted as a supplemental source of forage.

Specific accomplishments achieved to date include:

1. Widespread introduction of king grass as a source of cut-and-carry forage. Although in some cases it is planted as a pure stand, most farms have planted it as living barriers in soil conservation works.

2. Development of a complete technological assistance package for small to medium size multi-purpose cattle operations, oriented to increasing the quantity and duration of milk production.
3. Promotion of star grass as an improved pasture for dry season forage. Because star grass is stoloniferous (has runners) it has superior erosion control properties as compared to bunch grasses such as jaragua and king grass.

Constraints

The project technology has been designed and oriented primarily toward the larger farmers who have more than 5 cattle and who commercialize milk production. As presently organized, the livestock program has been successful in accessing only a few of the larger cattle operations in the watershed but has had relatively little impact on small farms.

Data compiled by livestock specialists (Table 2) show an impossibly high ratio of animals-to-farm-area for the small farmer. These ratios for smaller farms become even more skewed when one considers that many small farmers also own houses and oxen, which are not counted in Table 2. It is assumed that people with little land are using public lands for pasture.

Analysis of data from interviews with project participants indicated that large animals other than cattle are also important. Of the 92 participants interviewed, 63 percent had one or more large animals.

Table 2. Summary Statistics on Cattle Ownership and Land Available for Grazing, Choluteca Watershed (NRMP Handout)

Farmer Category	No. of Farms with Cattle	Area in Pasture (Ha)*	No. of Cattle	Animals per Ha†
A (1-5 cattle)	2,661	1,601	14,824	9.26
B (6-20 cattle)	1,987	7,662	15,708	2.05
C (>20 cattle)	816	<u>38,853</u>	<u>38,645</u>	0.99
TOTALS		48,116	69,217	

*Includes natural and improved pasture plus forest land owned by farmer, either by "dominio pleno" or "dominio util".

†NRMP specialists consider the following rates to be the maximum year round stocking rates permissible in the Choluteca watershed: unimproved pasture--1 cow/Ha; improved pasture--2 cows/Ha; improved and irrigated pasture--3 to 4 cows/Ha.

Of these, 28 percent had one or more oxen, 53 percent had one or more beast of burden (horse, mule, donkey); and 58 percent had one or more cows.

For the 92 persons, the corresponding large animal population was 78 oxen, 164 beasts of burden, and 670 cattle.

These data suggest that the livestock owned by small farmers are major contributors to the problem of over-grazing.

Most farmers have not yet begun to properly utilize grass and woody legumes which have been planted to augment forage. King grass in particular needs to be cut before reaching 1.5 m height else it becomes tough and loses palatability, yet in many places stands of king grass over 1.5 m tall was seen. Greater emphasis on the promotion of Jaragua (*Hyperinia rufa*) may represent a partial solution to this problem; it retains higher palatability at maturity than does king grass and has the added advantage that it does not need to be chopped.

The high labor input required to chop ("picar") cut-and-carry forage to increase palatability, constrains the use of this high yield system on large plots. The motor driven machinery available to chop grass is much too expensive for most farmers to purchase.

There has been a lack of coordination between the livestock and forestry components in promoting and establishing silvo-pasture systems such as improved browse in woodlands using species such as Lucaena spp., Glivicida sepium, Gassia grandes, Calliandra and Samanea saman.

Finally, it appears that the livestock and pasture component has not received as much emphasis within the project as many other activities. For example, there are only 5 "zootecnistas" among the 22 project field offices.

Recommendations

Strengthen the forage production and livestock management component of the small farm technological package. Focus should be placed on helping Class A farmers having less than 5 head of cattle, encouraging them to go toward an enclosure-feeding system in which the farmer would cut and carry the forage (both grasses like king grass and native legume forage trees like Leucuena spp.). It will probably be more feasible to promote this system as a dry season strategy rather than a year round practice.

Farmers should be given a "sample" quantity of salt and mineral supplement to demonstrate its importance in improving animal health and productivity.

Give greater emphasis to the planting of Jaragua grass planted as live barriers in soil conservation works. It provides a good, palatable

source of forage that has an advantage over king grass in that it does not need to be chopped to improve palatability.

Emphasize that king grass must be cut prior to attaining a height of 1.5 m. Above this height the blades become too dry and coarse and cattle may consider it to be unpalatable.

To compensate for the lack of "zootechnistas", provide reinforcement training in forage management strategies to extensionists in all agencies. This activity will also support the need for more generalized training of extensionists, as recommended in the section on "Rural Development Extension".

D. AGRICULTURAL DIVERSIFICATION

Significant Accomplishments

Small farmers depend on maize, beans and sorghum as the principal sources of vegetable protein and caloric intake. They rarely have access to animal protein other than an occasional chicken or pig. The price of beef (where available) places this protein source beyond the reach of most campesinos. Research has shown that when eaten together in adequate quantities, corn and beans provide the proper combination of amino acids for body growth and development. Nonetheless, these basic foods alone do not provide for a balanced diet. Unfortunately, many campesino families, particularly in the south, may go for months eating little other than corn, sorghum and beans.

Crop diversification can produce a variety of benefits, such as:

1. Nutritional improvement which accompanies increased dietary diversity,
2. Income generation by creating a marketable surplus,
3. Soil improvement and increased crop production by introducing rotations of nitrogen-fixing legumes and green manure crops.

The project has promoted diversification into vegetables (e.g., tomato, chile pepper, carrots, cabbage) and fruit trees (e.g., oranges, tamarind, avocado, nance). Vegetable production has been promoted in both men's

and women's components through activities such as provision of inputs and credit (for commercial vegetable production in Cabeceras area) and promotion of family gardens throughout the entire watershed.

Diversification into tree crops has been promoted by providing tree seedlings at no cost.

Because campesinos lack a tradition of vegetable consumption, promotoras have emphasized the nutritional value of these non-traditional foods and have demonstrated recipes for their preparation. During interviews a number of men indicated that the recipes were "very good" and that they liked to eat vegetables. Interview responses indicate that 70 percent of the families in the program have planted either vegetables or fruit trees with project assistance.

The project is developing techniques and demonstrating the high value of non-edible non-traditional crops which have a value as soil conditioners (e.g., rotations of velvet bean and other N-fixing cover crops) and as a source of green manure and forage (grasses and agro-forestry).

Utilization of these crops in conjunction with making of compost from their organic material can double and triple yields of basic grains.

This aspect of crop diversification is at least as important as the diversification of the edible crop mix.

Constraints

The most disappointing aspect of crop diversification efforts is the lack of attention which has been given to the promotion of improved varieties and greater diversification of tropical fruits. For example, although mangos are the most ubiquitous fruit on farms throughout most of the Cholulteca watershed, only one farmer was observed to have grafted an improved variety of mango. In some regions only one or two varieties of fruit trees were available (usually orange), and some apparently promising fruits which are extremely common and prolific elsewhere in central America (breadfruit, coconut, pomogranate, passion fruit, soursop) were apparently entirely overlooked. The argument that "people don't eat them" is invalid because, without any examples of these fruit in the environment, it is impossible for the population (and children in particular) to develop a taste for them. There was no evidence that attention had been given to the use of early and late season varieties in order to expand the production season, and grafting was rarely promoted.

Because tree crops represent an essentially permanent yet low maintenance crop, and farmers throughout the watershed demonstrated considerable interest in fruit trees during interviews, the lack of project effort dedicated to fruit trees is not justifiable. Part of the failure of the project to develop agricultural diversification to its full potential may rest in the over-specialization of extension agents; because their training focuses them in certain directions they tend to overlook other production possibilities such as tree crops.

In several instances project administrative personnel had not supported the planting of small areas of minor vegetable crops and herbs. The fact that certain minor crops had not been "officially studied" by the project was used as an excuse not to provide assistance in obtaining seed or material for vegetative propagation. This attitude is counterproductive to project goals.

Recommendations

1. Tree crops need to be given much greater emphasis in project activities. This should include training of extensionists and introduction of improved varieties and varieties that extend the production season, teaching of grafting, promotion of apparently under-utilized fruits (e.g., breadfruit, soursop, and undoubtedly others) and other activities which could increase both the quantity and diversity of fruits available to the campesino for consumption and income-generation.

Expand existing field trials currently being conducted with green manure (velvet bean-Macuna spp.) to include other cover crops having potential to increase soil fertility. Increased productivity per hectare should make it feasible to use rotations of fertility-enhancing legumes which will reinforce the productivity gains achieved using organic fertilizers and other techniques.

The Pan American Agriculture School at Zamorano has a collection of legume cover crops. Some of the species in that collection could be appropriate for incorporating into hillside farming systems such as basic grains, fruit tree and forest/grazing lands.

2. The project needs to promote greater flexibility in the support of more diverse crops, and particularly a number of "minor crops" which could improve dietary diversity and/or serve as an income-generating activity (flowers, herbs, food colorants, minor fruits, and vegetables). The project should not necessarily attempt to provide seeds and extensive technical assistance in this wide variety of crops, but as a minimum should serve as a clearinghouse for information on government and private sources for seed and vegetative material (fruit tree varieties at Zamorano, for instance).
3. Extensionists need to explore a wider variety of crop alternatives. These alternative crops should be attempted on a small scale at first to minimize risk, and the results obtained by various farmers (either good or bad) should be communicated to other farmers and extensionists. There is no need for the project to undertake feasibility studies for these crop alternatives prior to supplying farmers with limited quantities of seed and the lack of such studies should never be used as an excuse for preventing small scale experimentation (as has been the case previously).

Creativity in diverging from traditional cropping patterns is essential to the development of diversified farming systems. This creativity should be developed within the project staff, and insofar as possible transferred to farmers so that they will continually seek improved cropping alternatives on their own.

E. WOMEN IN DEVELOPMENT

Introduction:

The women's component of the Natural Resources Management Project (NRMP) was largely absent from the project during the start-up period of 1982-84. Five women were assigned to the project over this two year span, but their work was not seen as integral to the project nor was it structured to meet the goals of agricultural development and resource management. Rather, the work patterns of these early social promoters (promotoras sociales) fell into the traditional scheme of "home economics": teaching women to sew, embroider, can, and participate in group social activities.

This pattern of extension is now generally recognized as one which reinforces the sexual stereotyping of women's roles. It also ignores the realities of rural life in Latin America where many women participate actively in subsistence and economic activities. It is not uncommon for women to be the primary source of cash income through daily small-scale economic activities such as cutting firewood, baking bread for sale, handicrafts, pottery, or the sale of minor vegetable crops, herbs, and flowers. Many women also participate intermittently in field work, particularly during planting and harvesting. Finally, there exists the problem of underutilization of women in the development process. They are often excluded from major production roles as a result of sexual bias on the part of development institutions: credit opportunities, access to

subsidies, and participation in the formation of marketing cooperatives.

In 1984, members of the Chemonics staff of NRMP suggested that the women's component of the project needed assessment and enhancement if it were to break away from traditional patterns of women's activities and become a meaningful part of the project. As a result, a sociologist was contracted to conduct a study that would: a) identify the role of women in the project's target population, and b) propose a program to incorporate women into project activities. This study was completed in December, 1984. Following the recommendation that the women's component be expanded and that there should be an upgrading of personnel, the project hired an additional 16 women with university and technical school degrees. A supervisor of the women's component was to begin in January, 1985, but due to administrative difficulties did not begin work until July. In the meantime, the new staff were given a brief orientation and sent to the field. Although the project was committed to "proposing a program of training for field specialists to improve their skills for working with women in the context of the Project", this has yet to be implemented. The recently hired women's program supervisor conducted a one week workshop for staff soon after her arrival, but due to other obligations in program development, no additional training has occurred.

With only six months of serious activity in the Women in Development component of the project, it is apparent that the scope of the evaluation is limited. Nonetheless, extensive site visits and interviews, both with the client population (98 interviews) and project staff (13 interviews), reveal both accomplishments and potential improvements.

It should also be noted that the following section will present observations and recommendations that overlap with other sections of the evaluation. However, since the women's component (Women in Development) is dealt with as a separate issue in project management, it is important that these topics be covered here as well.

Significant Accomplishments

That the Women in Development component exists at all is an important accomplishment by the project. In spite of less than auspicious beginnings, a great deal has been achieved during the past year. The staff was enlarged to 23 promotoras, giving each agency a women's component, and a supervisor was hired. While training has been virtually non-existent, promotoras have moved ahead rapidly in a number of areas: 102 improved stoves have been constructed and 330 are programmed for 1986 for the 1336 families currently being served; 320 women are now participating in the program, individually or in groups; 99 houses have been improved (floors, walls, room divisions, furniture); 161 family gardens have been started that provide income as well as produce for

family consumption; 86 small projects including cottage industry with income-generating potential have been initiated; and an undertermined number of soil conservacion projects and agroforestry projects have been completed by women working with other women or with men.

In addition to establishing new groups, promotoras have been active in reconstituting previous local groups in existence prior to the program: church-affiliated clubs, old Recursos Naturales groups, CARITAS groups, and others. By taking advantage of existing structures, hours of organizational labor have been saved and the identification of female leaders has been greatly facilitated.

Although promotoras are still lacking in training, the new women's program supervisor acted quickly to put her field personnel through an initial training workshop. While somewhat superficial, this was a positive move.

The project is to be congratulated for the contracting of a sociologist to prepare a preliminary report on the status of women in the project's target areas. This report was comprehensive in scope and realistically evaluated the situation from a theoretical as well as practical standpoint. Many of the recommendations proposed in this report have been integrated into the women's component.

Finally, great strides have been made in planning women's program objectives for 1986, including formulating training sessions, field visits, and projecting activities for the year. Although the Evaluation Team has concerns regarding the annual planning process, it also recognizes that it is largely responsible for the accomplishments that are in very real evidence.

Constraints and Recommendations

1. **Training and Staff Orientation.** The promotoras have not been adequately trained for the tasks they are required to perform. It is naive to assume that a technical or university degree alone is adequate for extension work among campesinos. It was found in field observations that many promotoras have the necessary technical skills but cannot transfer this knowledge to the client population. It was also notable that university trained, versus technical school promotoras tended to be more successful in transmitting project technologies. This may be the result of a broader-based education with heightened sensitivities to social factors. In other cases, however, promotoras were lacking in important technical skills, impeding their effectiveness in the field. It was apparent that some promotoras were more experienced (experience gained in this agency or from previous projects) than others and were therefore more successful. Much of the technical knowledge learned in

universities and technical schools is not applicable to small farm situations, indicating that promotoras should be retrained in many areas. Finally, there are still problems, particularly among some of the older staff, in re-orienting their activities away from the more traditional home economics concepts and promoting those that have direct subsistence or economic impact on the family.

Recommendations. A training program in extension should be developed for promotoras. A member of the Chemonics team should be contracted for this task, working with the supervisor of the women's component to develop a program of specific skills to be mastered by promotoras. Preliminary work by the women's program supervisor has been completed in this area, resulting in six workshops planned for field personnel in 1986. Still, a training manual/guide needs to be developed for the women's component. This should not be the responsibility of the women's program supervisor alone since it would demand too much of her time and therefore compete with other important supervisory responsibilities such as field visits.

The training manual should stress an orientation toward meaningful subsistence and economic activities for women as a work priority. This is important not only in the development context

but is crucial to the validation of the women's component within the project itself. There is still a general attitude among many of the male project personnel that the women's component is somewhat superfluous and has been included only as a matter of form. Once campesino women become more visible as producers, the women's program will be given greater recognition and acceptance.

The training program should be balanced in terms of social and technical content. Ideally, university trained women should be contracted as opposed to those with only technical school degrees. Since this may be difficult to implement, personnel need extensive training in the social as well as technical aspects of extension work. This training component should make use of sociologists or anthropologists skilled in the dynamics of working with campesinos.

Training should be an ongoing process. Not only is this important from the perspective of learning new skills and reinforcing old ones, but also to maintain morale. In addition to the six planned formal sessions, informal meetings of promotoras should be held at least once a month to discuss progress and problems and to create an atmosphere of mutual reinforcement (this support seldom comes from male agency supervisors), are isolated

geographically as well as socially (the problem of being the only female at the agency), and thus have no outlet for discussing their problems, both professional and personal. This issue is extremely critical in the south since the promotoras do not have a female regional supervisor there. The project should move as quickly as possible to remedy this situation.

Putting young, inexperienced promotoras into an area solely for the purpose of having a woman in the agency is ineffective and can be counterproductive. Her inexperience may actually create negative situations that may take months of work to undo (in one case, improperly constructed LORENA stoves have convinced the local women that they should be abandoned as a project). Therefore, new promotoras should be placed in an agency with a promotora of proven abilities for a period of at least three months for on-the-job training. At the end of that period, the women's program supervisor together with the promotora-instructor should evaluate the trainee's progress before she is assigned to her own agency.

Finally, the training manual should stress a small farm system approach to intergrate the women's activities with those of the men. In order to build a productive homestead that will provide a higher standard of living for the family, women's activities

should be integrated into the comprehensive farm plan strategy proposed by the Evaluation Team. Only with a holistic approach to farm management will the goals of small farm development and resource conservation be attained.

2. Hiring Procedures. Because the project offers no job security (all personnel are on a year-to-year contract) and because extension work with campesinos is not considered to be a desirable long-term job by many professionally trained women who work as promotoras, there is a high turnover in project personnel. This weakens the project significantly in trying to maintain the momentum of project activities. Also, applicants for the position of promotora need to be selected carefully before they are given a position with the project. The Evaluation Team is aware that the reality of political patronage frequently circumvents even the best of hiring systems; nonetheless, if the project is to meet its goals, well qualified personnel must be selected. USAID should use whatever political leverage practicable and appropriate to ensure that personnel will be hired who have the training and background to carry out the goals of the project and that contracts be issued on a more permanent basis.

Recommendations. Hiring procedures for promotoras need to be established and then meshed with the training program. Criteria for hiring need to be established based on a job description.

Testing and/or interviews should be implemented to establish the following:

- (a) Attitude - aggressive; willingness to work in a campesino environment;
- (b) Aptitude - ability to interact socially with campesinos and adjust to difficult conditions in the field;
- (c) Level of training and need for additional skills.

Positive attitude and aptitude are far more important than advanced technical training since the ability to adapt to adverse conditions and work with highly conservative and traditional clients are the keys to successful extension. The project activities and technologies are relatively simple and straightforward (with the possible exception of the LORENA stove) and can be taught to virtually anyone. It should be remembered that these same skills are going to be taught by extensionists to a largely illiterate and technologically unsophisticated population.

Aggressiveness is another trait that should be selected for when hiring promotoras. In the agency situation which is dominated by males, there is a tendency to attempt to marginalize the female team member. Her work is typically considered to be of secondary importance and in several agencies the promotora has

fallen into the traditional pattern of subservience to the men. If the promotora is to be effective in her work, she must be aggressive enough to defend her professional needs. This problem was found in most agencies.

3. Personnel Evaluation. At present, extensionists do not receive any formal evaluation of their work performance, nor is there a standardized set of procedures to terminate someone who is not meeting performance expectations.

Recommendations. To ensure consistent job performance, promotoras should receive some type of annual evaluation. A system of merit incentives should also be instituted to encourage good extensionists to remain on the job and to motivate others to improve their performance levels. This should not be based solely on the meeting of quotas (metas) but should involve quality assessment as well. A type of peer review might be considered.

4. Program Planning and Implementation. The new supervisor of the women's program is to be complimented on the accomplishments of the women's component given the short period of time she has been with the project. Establishing quotas for specific activities and annual planning no doubt have contributed to many of

the successes of the program to date, but the planning methodology could be improved.

Recommendations. It is recognized that the majority of female field staff are still greatly lacking in the training and experience and that this may have contributed to the largely centralized planning effort. Henceforth, efforts should be made to allow for greater field input in the planning process. Each promotora should be trained to assess the needs of her agency, define priorities, and then develop a program of activities in consultation with the program supervisor. Based on these and other inputs, the supervisor should formulate her annual work plan for the Women in Development component. Greater flexibility needs to be built into the planning process to allow for individual agency differences and quotas should not drive the system. There should also be a mechanism whereby promotoras can experiment with new ideas. In the past, innovation has been discouraged, greatly to the detriment of the project (one promotora had several women interested in growing mint, but because this project had not been approved in the agency's work plan, her supervisor vetoed the idea).

Better record keeping of extensionists' daily activities also needs to be instituted. Each promotora should keep a record of her activities with groups and individuals. This will assist in planning future programs, help in evaluating the performance of the promotora, and orient her replacement when she leaves.

5. Program Management. To reduce bureaucratic interference between field staff and technical advisors, only two supervisors are recommended for the present scope of the women's component: the program supervisor in Tegucigalpa and a new supervisor for the southern region. One of the primary roles of the supervisors should be that of facilitator to field personnel. Promotoras consistently complained that they either could not get items requested (eg. chicken vaccine) or had to wait months for demonstration supplies (in one case, five months). Because of severe time constraints, several promotoras used their own money to purchase needed materials in order to successfully execute a project. A vaccine, for example, purchased by one promotora, saved the chickens of one small village while those in surrounding areas died. The village women are now convinced of the efficacy of vaccination and plan to continue it in the future. It is this type of significant intervention that the project should strive to achieve. If materials are not available when

needed, however, the promotora's capabilities as an effective extensionist are severely constrained.

Recommendations. Because of the bureaucratic red tape required in making unplanned-for purchases, it is recommended that a petty cash fund be established in each agency for promotora use. In terms of planned expenditures (stove pipes, chicken coop materials, canning jars, etc.), the women's program supervisor needs to be alert in following up on field requests. It cannot be over-emphasized that the success of the program depends on the ability of field personnel to carry out assigned tasks.

Central office staff orientation

should be toward serving the needs of field personnel and not field personnel awaiting the convenience of central staff.

6. Subsidies. There is general agreement among promotoras that subsidies may serve to generate interest in a project, but they are also concerned about creating a precedent that discourages individual initiative. Most promotoras agreed that the merits of the program alone should serve as the primary incentive if the project is to have any lasting effect on campesino lifestyles. Unfortunately, some extensionists used a lack of subsidies as an excuse for not getting out and promoting the program and its benefits.

Recommendations. It is recommended that all subsidies be discontinued on private land unless it is being used as a communal demonstration project. If it is determined that this is impractical, then efforts should be made to give women equal access to these products. In some agencies women receive food subsidies for soil conservation work, but in others they do not. Then too, it is common for these subsidies to be managed by the men's agricultural committees which do not always distribute fairly the women's share.

7. Milk Programs (lactarios). Several promotoras have agreed to act as agents in the procurement, transport, and distribution of surplus food products to be given to young children and pregnant and nursing women. Most promotoras agree that similar to subsidies, establishing a milk program is an excellent way to attract and maintain local women's groups. Like other forms of subsidies, it is based on paternalism and sets bad precedents for the initiation of project activities. Frequently the milk program is dependent on the presence of the promotora to obtain and transport the milk, and if the promotora is removed from the community the milk program will cease to function.

Recommendations. If lactarios are to be continued as part of the woman's program, the role of the promotora should be to instruct the group in how to solicit and transport these

products without her intervention. Only in this manner will the food program have any lasting effects both in terms of nutrition as well as in building cooperations.

8. The Promotora-de-Enlace Concept. One of the goals of the NRMP should be to establish an ongoing system whereby people continue to practice the new technologies without the constant intervention of extensionists. At present, the promotoras' impact is diluted because they are trying to cover a dispersed population in too large an area.

Recommendations. The role of the promotora should include identifying a local counterpart (Promotora-de-Enlace) and training her to carry project activities into her own or nearby community. In order to ensure that the Promotora-de-Enlace will have the incentive to share her knowledge, she should be compensated for her work. There needs to be a temporary retrenching of efforts focusing on two or three communities that can be given regular attention. It is during this period that the Promotora-de-Enlace should be identified and concentrated effort focused on her training. She should not, however, simply become an assistant to the promotora. Since the Promotora-de-Enlace is a local resident, she will ensure that the program objectives

continue to be realized even in the event of a change in personnel or termination of the project. Having a local campesina woman involved in daily contacts with residents also mitigates the problem of social class differences that may exist between the promotora and her clients.

Once the Promotora-de-Enlace attains a sufficient level of proficiency, the promotora can concentrate on another community where the process will be repeated. This slow but steady expansion should insure that communities are self-sustaining in their development efforts and that outside technical intervention will be applied only when necessary. The Promotora-de-Enlace concept will ultimately make better use of the promotora's time by allowing her to reach more communities with greater impact.

9. Marketing recommendations. At present, the project is not involved with marketing or marketing strategies. If women as well as men are to be encouraged to become better producers, they will need to learn marketing techniques appropriate to their particular economic situations. The project should move ahead to address this problem.

10. The LORENA stove. Since a great deal of the project's earlier interest in women's activities has centered on the LORENA stove,

it will be treated here as a separate topic. The success of this stove design has been highly variable, depending on the promotora's skill in constructing it. It should also be noted that the term "LORENA" has become generic among campesina women for any improved fogon. Thus women will frequently refer to their estufas mejoradas (improved stoves) as "LORENAS". Generally, however, very few working models of the true LORENA were found in the areas covered by the Evaluation Team. When questioned about true LORENAS, many women complained that they were too difficult and time-consuming to build, or that the back burners (hornillas) did not heat properly. A few claimed that the stove did not save wood and in one case, that it used more wood (no doubt due to improper construction and use). The design was also determined to be incompatible with local stove preferences: most women prefer to have a platform in front of the stove where children can sit, pots can be placed, and firewood piled. There was also considerable problem with having to re-cut firewood to shorter lengths to fit the small firebox. This, more than any other factor contributed to improper use (and thus lack of expected fuel savings) because the firebox door would be left open to accommodate long lengths of firewood.

Recommendations. The improved stove (estufa mejorada) needs greater attention to determine which models work best and are

most compatible with local custom. All the women interviewed who had an estufa mejorada were pleased with the stove's performance. They estimated that it saved a third of their fuelwood expenditures even without a firebox door, and the stovepipe eliminated smoke from within the kitchen. Several of the promotoras working with local women have tried different versions of an improved stove and have had excellent results. This type of innovation should be encouraged.

There are also alternative models of stoves that should be explored. For example, the Vermont Partners are having good success with a Costa Rican stove design that has been readily adopted by women in the Sabanagrande area with relatively little promotion. The advantages of this stove are: a larger (longer) firebox to accommodate longer wood; simple construction design that incorporates the front platform; and metal-covered burners that can be used directly for cooking tortillas (like a comal), heat rapidly, and have the additional advantage of not blackening pots, a characteristic that women found particularly desirable. These stoves also conserve up to 50 percent of fuelwood normally used and cost about the same as a LORENA or estufa mejorada (approximately 15 Lempiras for the LORENA, 20 for the Costa Rican design).

In conclusion, while there are many areas of the Women in Development program that need improvement and restructuring, notable achievements have been made under adverse circumstances. The women's program supervisor has accomplished much in her short tenure with the NRMP. Perhaps of even greater importance is her constructive feminist commitment to creating an effective and meaningful program to incorporate women into the development process.

F. PUBLIC VS. PRIVATE SECTOR INTERVENTIONS

In its Scope of Work the team was asked to make a quick review (4 person/days) of the Vermont Partners of the Americas project (AID Project 522-0227) being implemented in the Sabanagrande area and make recommendations regarding the consolidation of this project with the NRMP (AID Project 522-0168). As a conclusion of the review it is recommended that the projects not be consolidated. This recommendation refers to the budget line item, technical direction and philosophy of the projects, not necessarily to the consolidation of project numbers in the AID portfolio. Implicit is the recommendation that the funding of the Partners project be continued.

The two projects focus on similar problems with different secondary objectives. The NRMP seeks to institutionalize project activities as an integral part of the nationally budgeted programs of the Ministry of Natural Resources. In contrast, the Partners as a PVO are dedicated to involving Honduran private organizations in voluntary efforts to promote development of their country. Both are very important and complementary approaches to conserving natural resources and improving the well-being of small farmers. Small projects with private organizations provide the opportunity for innovation without the cumbersome task of working through a large bureaucracy. Successful experiences can be adapted and extended by public agencies. If the degradation of the human environment in

Honduras is ever to be halted and quality of life improved, it will ultimately be the result of effective government action. Private efforts are essential in leading and pushing the process.

Although the opportunity to evaluate the Partners project was limited, the team gained impressions consistent with experience and observations elsewhere. Foremost were:

1. Paid para-technical campesinos were seen to have an excellent rapport with their constituents.
2. A combination of conservation structures and yield improvement measures were stressed. Because no subsidies were used, it can be said with a certain degree of confidence that participants were convinced of the productive value of the effort.
3. The unsubsidized terraces and other works constructed are less elaborate and somewhat less permanent than those constructed with subsidy. The significance of this difference, in erosion control, in crop yield, in costs and in propensity of campesinos to maintain structures should be the subject of a comparative longitudinal study.
4. The NRMP was found to have greater technical resources and had gained experience that could be effectively adapted to the Partners project. Conversely, the NRMP would find the experience with unsubsidized conservation measures using paid para-technicians useful.

VII. ANALYSIS OF PROJECT BENEFITS AND COSTS

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(Reprinted in its entirety)

SURVEY METHODOLOGY

The Scope of Work for the Project Evaluation suggested that a sample size of 100 personal interviews would be sufficient to obtain a good representation of the progress of the project across all subwatersheds. Based on the number of small farmers being served by each of the extension teams, and also on the number of small farmers joining the project by different years (1982, 1983, 1984 or 1985), we attempted to stratify the number of interviews by agency and by length of participation in the project.

Our expectation was to interview 50 small hillside farmers in the Headwaters (Cabeceras) and 50 small hillside farmers in the South (Sampile/Guasuale, Soledad/Texiguat, and Orocuina), since the number of people being served was approximately equally divided among the two regions. However, due to our having to interview on national holidays (Presidential inauguration day was January 27), and due to scheduling mix-ups as to when the agency team expected us at their office, we were not able to obtain the planned number of interviews in Zamorano and Lepaterique in the Headwaters, and Texiguat in the South.

We developed the survey form the first three days, field tested it in Santa Lucia on Thursday, January 16, revised it and began interviewing with the revised survey instrument on Saturday January 18. Due to the fact that we had six members on the

Evaluation Team, there is some variability in responses written on the survey, depending on the particular interest of the specific interviewer. This is to be expected; however, a more intensive briefing on the types of data needed for the benefit-cost calculations may have led to more specific responses on production figures for both basic grains and horticultural crops, so as to obtain a better comparison of yields before and after participation in the Natural Resources Management Project

THE ACTUAL SAMPLE

We interviewed 92 small farmers, 51 in the South and 41 in the Headwaters (Cabeceras) (Table 1). As indicated in the Table 34 of the small farmers interviewed had been participating in the Project one year or less; 24 had been participating two years; 20 three years; and 13 had been participating more than three years (or since the Project began in 1982). The number of interviews by years of participation in the Project is a good approximation of how the number of participants served by the Extension Teams has increased over the life of the Project.

Some socio-economic characteristics of the respondents are reported in Table 2. The average age of the small farmers interviewed was 43 for both areas; 45 years in the Cabeceras and 42 years in the South. The range in ages of the respondents was 23 to 82. The average number of children living per family was 5.3; with the families in the South averaging 6 children and those in the Cabeceras averaging 4 children. The range in number of children living was 0 to 13.

TABLE 1: NUMBER OF PERSONAL INTERVIEWS (SURVEYS) TAKEN BY AGENCY OR ZONE, BY THE 1986 NRMP EVALUATION TEAM

CABECERAS	NUMBER	NUMBER OF YEARS IN PROJECT			
		0-1	2	3	3+
Santa Lucia	6	2	1	3	0
Tatumbla/Sabacuante	13	4	4	1	4
San Buenaventura	6	4	2	0	0
Ojojona	6	0	0	4	2
Lepaterique	6	1	2	2	1
Jutiapa	3	2	1	0	0
Zamorano	1 ^{a)}	1	0	0	0
Subtotal	<u>41</u>	<u>14</u>	<u>10</u>	<u>10</u>	<u>7</u>
<u>SAMPLE/GUASAULE AND OTHER SOUTH</u>					
El Triunfo	12	2	2	3	5
Namasigue	10 ^{b)}	4	3	1	1
Concepcion de Maria	9	6	1	2	0
Yusguare	6	1	3	2	0
Orocuina	8	5	3	0	0
Soledad	4	1	1	2	0
Texiguat	2 ^{c)}	1	1	0	0
Subtotals	<u>51^{b)}</u>	<u>20</u>	<u>14</u>	<u>10</u>	<u>6</u>
Total All Surveys	92	34	24	20	13

a) The NRMP Team in Zamorano had expected the Evaluation team to arrive on Tuesday, January 21, 1986. When we arrived a day later, it was not possible to find committee members or independents working with the Project.

b) One small farmer interviewed was not participating in the NRMP.

c) We visited Texiguat on Monday, January 27, 1986, the day of the Presidential inauguration. It was not possible to find people at home.

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TABLE 2 : SOME CHARACTERISTICS OF SMALL FARMERS SURVEYED BASED ON INTERVIEWS BY
1986 NRMP EVALUATION TEAM

	<u>Average Age of person In- terviewed</u>	<u>Range in age</u>	<u>Average Number of Children</u>	<u>Range in number of Children</u>	<u>Average size of farm mz.</u>	<u>Range in size of farm mz.</u>	<u>Owner of Land</u>
<u>CABECERAS</u>							
Santa Lucia	45	30-60	4	0-11	8.9	1-15	6
Tatumbia/Sabacuante	43	25-64	4	0-10	8.8	1-43	7
San Buenaventura	50	33-58	5	4-8	45.0	2-231	4
Ojojona	51	39-65	5	4-7	4.5	1-10	5
Lepaterique	39	23-60	4	0-7	3.0	.25-10	6
Jutiapa	43	33-53	9	8-12	2.3	1-4	1
Zamorano	38	-	5	-	2.0	-	0
Subtotals	45	23-65	4	0-12	12.0 (6.0)	.25-231	29
<u>SAMPLE/GUASUALE AND OTHER SOUTH</u>							
El Triunfo	43	32-74	7	0-12	3.8	.5-9	11
Namasigue	42	23-82	6	2-12	3.62	1.25-5	7
Concepcion de Maria	38	26-65	5	1-13	3.7	.25-10	6
Yusguare	45	29-62	4	1-10	10.1	1-30	6
Orocuina	46	38-67	6	4-11	2.3	.5-2	7
Soledad	51	34-67	5	0-10	3.8	.5-8	3
Texiguat	32	30-34	6	5-9	1.6	.5-1.25	1
Subtotals	42	23-82	6	0-13	4.1	.5-30	41
Total all surveys	43	23-82	5.3	0-13	7.6 (5.2)	.25-231	70

The average size farm per family was 7.6 manzanas; however this is a misleading figure since one farmer in San Buenaventura had 231 manzanas and the other five farmers interviewed had a total of 39 manzanas. Adjusting the San Buenaventura average and the Cabeceras average by deleting the one large farm results in an average size farm of 8 manzanas in San Buenaventura and 6.0 manzanas for the Cabeceras; and an average size farm of 5.2 manzanas for 91 farms. This average still is slightly larger than the average size farm of the majority of the participants in the Project (likely 4 manzanas or less.)

Twenty-nine of 41 respondents in the Cabeceras stated they were owners of the land being farmed, 41 of 51 indicated they were owners in the South. This high percentage of ownership (70 of 92 or 76%) may be misleading, since many of those stating ownership did not have full title (dominio pleno) or proper ownership documentation to their land. Thus, many of those claiming ownership are not able to make loans with BANADESA through the Project, since they don't have proper documentation.

Thirty one of the small farmers interviewed had an irrigation system; 23 of 41 in the Cabeceras and 8 of 51 in the South (Table 3). Nineteen had pilas or water storage structures; 13 in the Cabeceras and only 6 in the South. Of these structures, the Extension Team Personnel had provided technical assistance and/or arranged loans and subsidies on 5 of these structures, generally all for groups or committees.

TABLE 3: NUMBER OF SMALL FARMERS WITH IRRIGATION SYSTEMS AND WATER STORAGE TANKS BASED ON INTERVIEWS BY 1986 EVALUATION TEAM

<u>AGENCY</u>	<u>Irrigation water System</u>	<u>Pila Storage Tank</u>	<u>NRMP help on pila</u>
<u>CABECERAS</u>			
Santa Lucia	4	3	0
Tatumbla	7	3	2
San Buenaventura	3	2	0
Ojojona	1	1	1
Lepaterique	5	1	0
Jutiapa	2	2	0
Zamorano	1	1	0
Subtotals	<u>23</u>	<u>13</u>	<u>3</u>
<u>SAMPLE/GUASUALE AND OTHER SOUTH</u>			
El Triunfo	2	0	0
Namasigue	0	1	0
Concepcion de Maria	2	0	0
Yusguare	1	3	1
Orocuina	2	0	0
Soledad	1	1	1
Texiguat	0	1	0
Subtotals	<u>8</u>	<u>6</u>	<u>2</u>
Totals all Surveys	31	19	5

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Significant progress has been made in 1984 and 1985 in the number of small farmers in the Project who have planted grasses for forage or silage (pastos de corte) and/or who have planted improved pastures. This aspect of the Project should continue to gain momentum in 1986 and in future years. Twenty five respondents in the Cabeceras and 16 in the South had planted pastos de corte; many of these were planting these grasses (typically King Grass) in living barriers where terraces have been constructed. (Table 4). A total of 28 respondents (13 in the Cabeceras and 15 in the South) had planted improved pastures as of the end of 1985. This pasture typically was African Star Grass, although Jaragua also is being planted.

Soil conservation projects are a key aspect of the Natural Resources Management Project. Building rock walls or various kinds of terraces and drainage canals have been widely implemented. As show in Table 4, 78 of the 92 small farmers interviewed had constructed one or more types of soil conservation structure (rock wall, terrace, etc.) on their land; 30 of 41 in the Cabeceras and 48 of 51 in the South (Table 4). It should be mentioned that for some of the small horticultural farms in the Cabeceras, soil conservation projects are not needed, since the small fields (typically $\frac{1}{2}$ manzanas or less) are generally flat or level. Seventy-one of the 78 respondents with soil conservation projects stated they had received technical and/or financial assistance through the Project; only 7 had built these structures before the Project began and/or through their own initiative.

TABLE 4: NUMBER OF SMALL FARMERS WITH PASTOS DE CORTE, IMPROVED PASTURES AND SOIL CONSERVATION PROJECTS BASED ON INTERVIEWS BY 1986 NRMP EVALUATION TEAM

<u>CABECERAS</u>	<u>Pastos de Corte</u>	<u>Improved Pastures</u>	<u>Soil Conservation Works</u>	<u>Built with Aid of NRMP</u>	<u>Abonera (organic fertilizer) compost</u>
Santa Lucia	2	0	5	5	0
Tatumbia/Sabacuante	10	6	9	8	3
San Buenaventura	5	4	3	2	1
Ojojona	4	2	4	2	3
Lepagerique	3	0	5	5	2
Jutiapa	0	0	3	2	1
Zamorano	1	1	1	0	0
Subtotals	25	13	30	24	10
<u>SAMPLE/GUASAULE AND OTHER SOUTH</u>					
El Triunfo	7	2	12	12	6
Namasigue	2	1	8	8	3
Concepcion de Maria	1	3	9	9	7
Yusguare	4	4	6	6	4
Orocuina	1	4	7	7	7
Soledad	1	1	4	3	4
Texiguat	0	0	2	2	2
Subtotals	16	15	48	47	33
Total all Surveys	41	28	78	71	43

TABLE 5: SOME SOCIAL AND FAMILY WELFARE ASPECTS OF SMALL FARMERS INTERVIEWED BY 1986 NRMP EVALUATION TEAM

<u>AGENCY</u>	<u>Family members in Amas de Casa Club</u>	<u>Improved Stove</u>	<u>Latrine</u>	<u>Family Garden</u>
<u>CABECERAS</u>				
Santa Lucia	1	0	1	3
Tatumbla/Sabacuante	7	5	5	7
San Buenaventura	1	1	4	1
Ojojona	3	2	2	2
Lepaterique	1	4	3	6
Jutiapa	0	0	2	2
Zamorano	1	0	1	0
Subtotals	14	12	18	21
<u>SAMPLE/GUASAULE AND OTHER SOUTH</u>				
El Triunfo	7	4	7	9
Namasigue	3	2	6	4
Concepcion de Maria	3	0	5	3
Yusguare	2	3	3	1
Orocuina	5	0	2	3
Soledad	3	0	0	2
Texiguat	2	1	0	1
Subtotals	25	10	23	23
Total all Surveys	39	22	41	44

Forty-three of the 92 respondents had built aboneras or organic compost piles for organic fertilizer; 10 in the Cabeceras and 33 in the South. It should be mentioned that many of the small farmers respondents are buying and using chicken manure (gallinasa) on their horticultural crops, and haven't seen the need to build organic composts.

Several questions were asked during the interviews about the family and social welfare aspects of the small farm families. Thirty-nine of the 92 small farmers interviewed indicated that their wives and/or some other member of the family was participating in a home demonstration club (Club de Amas de Casas) (Table 5). The home extension specialist (promotora social) is working with many of these women in home improvement activities, relating to diets, nutrition, growing and using vegetables and fruits, etc. It is significant that almost one-half (25 of 51) of the families interviewed were participating in such activities in the South, and only one-third (14 of 41) in the Cabeceras.

Only 22 of the families interviewed had built an improved stove (a Lorena or improved modification of the Lorena stove). The extension teams had as an original goal to promote the construction and use of these stoves; however this activity seems to have slacked off in emphasis in the last year or so. Forty-one of the 92 families interviewed had a latrine (Table 5). However, many of these had been built in earlier years before participation in the NRMP; and/or, the latrines had been built without the assistance of the NRMP Extension Team.

The home extension specialist and other members of the NRMP teams have been encouraging the families to plant family gardens with vegetable crop such as tomatoes and cabbage, and fruit trees near the home. As indicated in Table 5, 44 of the families interviewed had such family gardens. Some of the fruit trees had been planted several years ago, before the participation of the family in the NRMP.

The farmers interviewed were asked about their cropping program and if changes had occurred in the types of crops produced after they began participating in the NRMP. For example, had they shifted from basic grains (beans and corn) to horticultural crops with the encouragement and assistance of the Extension specialist in the NRMP. As indicated in Table 6, nine of the 21 small farmers interviewed in the Cabeceras had shifted to horticultural crops, and 12 of 51 in the South had begun producing other crops after they joined the project. While the total percentage shifting to other crops is not high (21 of 92 or 23%), there were some significant changes occurring in the use of improved seeds, better technical practices, use of either purchased chemical fertilizer or organic fertilizer (aboneras) or both, and the use of irrigation to produce more or different crops during the dry season.

Certainly significant is the large number of respondents indicating improvements in yields after they began participating in the NRMP. Seventy of the 92 small farmers (76%) indicated that they were getting production increases. The

TABLE 6 : IMPACTS OF PRACTICES ADOPTED THROUGH NATURAL RESOURCES MANAGEMENT PROJECT ON CROPS PRODUCED AND ON YIELDS BASED ON INTERVIEWS BY 1986 NRMP EVALUATION TEAM

	<u>Changes in Crops planted after joined NRMP</u>	<u>Changes in yields after joined NRMP</u>
<u>CABECERAS (41 interviews)</u>		
Santa Lucia	0	5 ^{a)}
Tatumbra/Sabacuante	7	10 ^{b)}
San Buenaventura	0	2 ^{c)}
Ojojona	1	3
Lepaterique	1	2
Jutiapa	0	3
Zamorano	0	1
Subtotals	9	26
<u>SAMPLE/GUASAULE OR OTHER SOUTH (51 interviews)</u>		
El Triunfo	5	12
Namasigue	3	8
Concepcion de Maria	2	8
Yusguare	0	4
Orocuina	2	8
Soledad	0	4
Texiguat	0	0
Subtotals	12	44
Totals all Surveys	21	70

a) One of the small farms only had forestry

b) Two of the small farmers interviewed in Tatumbra only had pasture and cattle.

c) Two small farmers only had pasture and cattle and one had forestry c

actual percentage of crop farmers in the NRMP getting increased yields is even higher since one of the 92 respondents was not in the NRMP, and several others in the NRMP had only pastures with cattle, and/or forestry. Thus, one of the success highlights of the NRMP has been the significant increases in yields of both basic grains and other traditional crops such as potatoes, and horticultural crops.

ACTUAL AND PROJECTED COSTS OF NRMP

As originally planned and approved by both AID and GOH, the Natural Resources Management Project was to be implemented over the five year period July 1980-July 1985. However, delays occurred in implementation because of the changes in Ministry of Natural Resources personnel during the transition period in the GOH in the early 1980's. The NRMP, therefore, did not effectively begin until June or July 1982. The programmed costs were \$14,995,000 by USAID and \$6,967,000 by GOH.

The first NRMP Evaluation Team in January 1984 recommended a three year extension of the Project, to July 1988, so that the major soil conservation objectives could be implemented in the major sub-watersheds of the Choluteca River Watershed. AID approved a two year extension of the NRMP to July 1987 at the same funding level. Currently, plans are to request another one year extension to July 1988. Thus, the projected costs of the NRMP are shown for the entire eight year period 1980-88.

As indicated in Table 7, the actual expenditures for the

TABLE 7: ESTIMATED BUDGET FOR NATURAL RESOURCES MANAGEMENT PROJECT IN HONDURAS (AID 522-0168)
BUDGET YEAR 1980-88 (IN U.S. DOLLARS)

CATEGORY AND ITEM	1980 and 1981	1982	1983	1984	1985	1986 ¹⁾	1987 ¹⁾	1988 ¹⁾	TOTALS
<u>RMP Project Office</u>									
Personnel	70,000	80,000	80,000	90,000	100,000	800,000	900,000	1,000,000	3,120,000
Vehicles	30,000	160,000	60,000	180,000	-	500,000	400,000	200,000	1,530,000
Maintenance	-	120,000	20,000	40,000	40,000	130,000	190,000	200,000	740,000
Miscellaneous	40,000	241,000	513,000	562,775	449,697	845,528	1,000,000	1,000,000	4,752,000
Subtotals	140,000	601,000	673,000	872,775	589,697	2,275,528	2,490,000	2,500,000	10,142,000
<u>Hydrology Office of MNR</u>									
Personnel	-	-	-	10,000	20,000	-	-	-	30,000
Equipment	-	-	-	-	180,000	-	-	-	180,000
Subtotals	-	-	-	10,000	200,000	-	-	-	210,000
<u>National Cadaster</u>									
Personnel and TA	263,000	600,000	100,000	-	30,000	30,000	-	-	1,023,000
Computer	-	-	-	-	-	500,000	100,000	50,000	650,000
Vehicles	-	-	500,000	-	-	-	-	-	540,000
	263,000	600,000	600,000	-	30,000	530,000	100,000	50,000	2,173,000
<u>Telecommunications & Other TA's</u>									
	-	-	300,000	700,000	700,000	350,000	220,000	200,000	2,470,000
	403,000	1,201,000	1,573,000	1,582,775	1,519,697	3,155,528	2,810,000	2,750,000	14,995,000
Accumulated Total	403,000	1,604,000	3,177,000	4,759,775	6,279,472	9,435,000	12,245,000	14,995,000	

GOH BUDGET BY YEARS FOR SUPPORT OF NRMP PROJECT (IN U.S. DOLLARS)

	1980	1981	1982	1983	1984	1985	1986 ²⁾	1987 ²⁾	TOTALS
MNR	53,126	149,676	323,835	457,600	752,500	2,373,250	2,619,152	-	6,729,139
DEC	8,809	35,099	53,630	15,323	125,000	-	-	-	237,861
Total GOH	61,935	184,775	377,465	472,923	877,500	2,373,250	2,619,152	-	6,967,000
Accumulated Total	61,935	246,710	624,175	1,097,098	1,974,598	4,347,848	6,967,000	-	

Source: AID Project Office

1) Projected

2) Based on GOH Projections

NRMP were very small in 1980 and 1981. As of the end of the 1985 Budget year for the Project, actual expenditures were \$6,279,472 by USAID and \$1,974,598 by the GOH. The projected expenditures for the remaining three years of Phase I of the Project are shown in Table 7. The large increase in costs occurs for two major reasons. Expansion of the Project into the Talanga subwatershed with the opening of seven new extension offices and staffing those teams necessitates the purchase of more vehicles and equipment. The Project plans to serve 1500 small hillside farm families in that subwatershed.

The second major reason for the large increase in expenditures in 1986-88 is due to the planned implementation of the Fellowship Training Program for NRMP personnel. AID proposes to send 25 or more Project personnel to US and other Universities for training. Some of these personnel will complete BS degrees in selected agricultural fields; other will study at the graduate level. An estimated \$1.0 to \$1.5 million will be needed to support this vital part of the NRMP during the next three years.

NRMP COSTS ADJUSTED FOR PERMANENT INVESTMENTS IN LAND SURVEYING, CLIMATOLOGICAL MEASURING, AND HIGHER EDUCATION TRAINING

For purposes of economic evaluation of the NRMP, some of the projected costs have been deducted from the \$21,962,000 budgeted for the NRMP (\$14,995,000 by USAID and \$6,967,000 by GOH). The reason for these adjustments are that much of the soil surveys and mapping data of the National Cadaster, and much of the hydrological and related climatological data to be collected and analyzed by the Hydrology Section of MNR, are

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data that will be available for use by many governmental agencies as well as by private individuals in the future. The costs for developing such data are long run investments to provide a data base on a one-time basis.

As indicated in Table 8, the adjusted costs by AID for the NRMP are projected to be \$12,108,500. The projected GOH expenditures of \$6,967,000 over the life of the project have not been adjusted. The final actual costs devoted to the NRMP are projected to be \$18,075,500 for economic evaluation purposes.

TABLE 8: ESTIMATED BUDGET FOR NATURAL RESOURCES MANAGEMENT PROJECT IN HONDURAS ACTUALLY DEVOTED TO SOIL CONSERVATION AND RELATED PROGRAMS IN FISCAL YEARS 1980-1988

<u>CATEGORY AND ITEM</u>	<u>AID TOTAL EXPENDITURES</u>	<u>GOH TOTAL EXPENDITURES</u>	<u>TOTAL ALL EXPENDITURES</u>
Personnel (NRMP)	\$ 3,120,000	--	\$ 3,120,000
Vehicles	765,000 ¹⁾	--	765,000
Maintenance	740,000	--	740,000
Miscellaneous	3,252,000 ³⁾	--	3,252,000
National Cadaster	761,500 ²⁾	--	761,540
Telecoms & other TA	<u>2,470,000</u>	<u>--</u>	<u>2,470,000</u>
Totals	\$11,108,500	\$ 6,967,000	\$18,075,500

- 1) Only one-half of the estimated \$1,530,000 expected for vehicles has been charged to the life of this project. Most of the vehicles should have another five years of useful life after FY1988.
- 2) The \$210,000 expended for the Hydrology Office of MNR, the \$650,000 for the computer and computer services in National Cadaster, one-half of the estimated expenditure of \$500,000 for vehicles, and one-half of the \$1,023,000 for personnel and TA in National Cadaster were not charged to the NRMP. The entire country, i.e., other agencies and functions of Government will benefit by the Climatological metering stations, and the soil survey data and other maps and materials prepared by these two offices. These benefits will accrue for many years in the future.
- 3) The estimated \$1.5 million programmed for training 25 or more NRMP Extension personnel has been deducted from the NRMP costs for economic evaluation purposes. That investment will be long lasting and have a significant favorable impact on the future productivity of the Ministry of Natural Resources programs in Honduras. Since the NRMP (Phase I) will be completed before these young professionals return to their country, the investment costs in their education should be treated separately.

DETERMINATION OF YIELD INCREASES AND OTHER
BENEFITS AS A RESULT OF TECHNICAL AND OTHER
ASSISTANCE FROM NRMP EXTENSION PERSONNEL

This section of the report presents background data and/or substantiation for the benefits calculated as a result of participation in the NRMP. An effort has been made to present explanatory footnotes in each Table so that the reader can understand how the values were determined.

As indicated in Table 9, a total of 3,213 manzanas of farm land is expected to be protected by soil conservation works through the NRMP by 1988. The data shown in Table 9 was used to calculate the benefits, in terms of value of soil saved, that are presented in Table 10.

Research studies by Agronomists and Agricultural Economist in Illinois and Kentucky have demonstrated that the loss of 6 inches of top soil has caused a reduction in corn yields of 12 bushels or more per acre per year. A bushel of corn weighs 70 pounds. $12 \times 70 \text{ Lbs} = 840 \text{ Lbs}$ lost per acre/yr or 2,075 Lbs per hectare/yr. (1 Ha. = 2.47 acres \times 840). This is approximately 19 quintales/hectare. Assuming a market price of Lps.15 per quintal means an annual loss per hectare of Lps.285 or US\$142.50 last year for 25 years is \$1,821.15 U.S., based on the PV factor of 12.78. Since soil weighs approximately 330 tons/ha/inch, then the loss of 6 inches of top soil is 1980 tons. Dividing \$1,821.15 by 1980 tons results in a "value" per ton of US\$92. Since the figures are approximations, an acceptable value per ton of soil saved is US\$1. This is the value used to calculate the value of soil saved in Table 10.

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TABLE 9 : AMOUNT OF LAND PROTECTED BY SOIL CONSERVATION WORKS, BY SUBWATERSHED AND TOTALS WITH TECHNICAL ASSISTANCE PROVIDED BY NATURAL RESOURCES MANAGEMENT PROJECT, 1983-85, AND PROJECTED TO 1988 (Units in Hectares until converted to Manzanas).

<u>YEAR</u>	<u>CABECERAS</u>	<u>SOUTH</u>	<u>TALANGA</u>	<u>TOTAL</u>
1983	104.29	33.71	-	138.00
1984	72.25	271.00	-	343.25
1985	<u>86.20</u>	<u>290.90</u>	-	<u>377.10</u>
Subtotal	262.74	595.61	-	858.35
1986-88	<u>262.74^{a)}</u>	<u>595.61^{a)}</u>	<u>330.00^{b)}</u>	<u>1,188.35</u>
Total 1986-88	525.48	1,191.22	330.00	2,046.70
manzanas ^{c)}	825.00	1,870.22	518.10	3,213.32

Source: Data for 1983-85 and 1986 Talanga goal provided by NRMP office.

- a) Assumption is that as many hectares will be protected by soil conservation works in the 1986-88 period (3 years) as in 1983-85.
- b) Target for Talanga subwatershed is 110 hectares for 1986. Assumption is for three times that amount or 330 hectares for 1986-88.
- c) Converted on basis of 1.57 manzanas per hectare.

TABLE 10: VALUE OF SOIL SAVED USING SOIL CONSERVATION WORKS, INSTALLED BY SMALL FARMERS PARTICIPATING IN THE NRMP, 1980-85, 1980-88, and 1980-90.

	1980-85 ²⁾	1980-88 ³⁾	1980-90 ⁴⁾
<u>CABECERAS</u>			
Hectares protected	263	500	750
Ha. inches soil saved	526	2,500	5,250
Total soil saved, ¹⁾ (tons)	176,736	840,000	1,764,000
Value of soil saved	\$176,736	\$840,000	\$1,764,000
<u>SAMPLE/GUASAULE</u>			
Hectares protected	524	1,000	1,500
Ha. inches soil saved	1,048	5,000	10,500
Total soil saved, ¹⁾ (tons)	352,128	1,680,000	3,528,000
Value of soil saved	\$352,128	\$1,680,000	\$3,528,000
<u>TEXIGUAT/OROCUINA/SOLEDAD</u>			
Hectares protected	72	150	200
Ha. inches soil saved	72	600	1,200
Total soil saved, ¹⁾ (tons)	24,192	201,600	403,200
Value of soil saved	\$24,192	\$201,600	\$403,600
<u>TALANGA</u>			
Hectares protected	-	330 ⁵⁾	550 ⁵⁾
Ha. inches soil saved	-	660	1,650
Total soil saved (tons) ¹⁾	-	221,760	554,400
Value of soil saved	-	\$221,760	\$554,400
<u>TOTAL ALL SUB-WATERSHEDS</u>			
Hectares protected	859	1,980	3,000
Total soil saved, ¹⁾ (tons)	553,056	2,943,360	6,250,000
Value of soil saved based on \$1 ton	\$553,056	\$2,943,360	\$6,250,000

N: 1) Based on average weight of soil of 75 pounds per cu. ft. or 136 tons per acre inch. Since 1 Ha = 2.47 acres, then 1 inch of top soil over 1 Ha = 2.47 x 136 tons = 336 tons of soil per ha/inch.

2) Based on 2 inches of top soil saved in Cabeceras and Sampire/Guasaule and 1 inch of soil saved in Orocuina/Texiguat/Soledad, according to average number of years practices have been installed.

3) Based on 5 inches of soil saved per Ha. in Cabeceras and Sampire/Guasaule, 4 inches of soil saved per Ha. in Orocuina/Texiguat/Soledad and 2 inches of soil saved per Ha. in Talanga.

4) Based on 7 inches of soil saved per Ha. in Cabeceras and Sampire/Guasaule, 6 inches of soil saved per Ha. in Orocuina/Texiguat/Soledad and 3 inches of soil saved per Ha. in Talanga.

5) The 1986 target for the Talanga subwatershed is to protect 110 Ha. with soil conservation Projects (works). The assumption was made that this goal will be met each year through 1990.

Some representative yields and prices for horticultural crops produced in the Cabeceras subwatershed are presented on Table 11. These figures were obtained from the farmer interviews. As can be seen, the estimates of yields fluctuate greatly; thus, it is difficult to select a "before and after" yield per manzana, based on participation in the NRMP.

A representative crop production budget for corn (maiz) using traditional methods is presented in Table 12. As indicated, there is a negative cash flow, or loss, based on the production and sale of 8 qq/mz.

The NRMP Extension office in Concepcion de Maria provided the information presented on Table 13. For five farms in the NRMP using improved agronomic practices, the average yield of corn was 25 qq/mz. This compares to a regional average yield of about 10 qq/mz.

The NRMP Extension office in Soledad provided the budget data presented in Table 14. Using improved agronomic techniques as advocated by the NRMP, the net benefit for one manzana of corn is 50 lempiras, even after making a change for land clearing and soil conservation work. Another case study for corn production in the Soledad region is presented in Table 15. This budget estimates a net benefit of 252.5 lempiras per manzana for corn, using improved agronomic techniques.

TABLE 11: SOME REPRESENTATIVE YIELDS AND PRICES FOR HORTICULTURAL CROPS IN THE CABECERAS SUBWATERSHED OF THE NRMP, 1985 CROP YEAR.

<u>CROP</u>	<u>UNIT</u>	<u>ESTIMATES OF YIELDS/Hz.</u>	<u>PRICES RECEIVED (Lps.)</u>
Beans	Quintales	5,36,12,8,8,12	
Beets	Bultos or Matates	300,96	52/bulto
Broccoli	Heads	8,000	3/dozen
Cabbage	Bultos or Matates	50,640(?),400,200, 1,000(?),200,40,400	60/bulto
Carrots	Bultos or Matates	150,144,200,60	80/bulto
Cauliflower	Bulto or Matate	240,250,280	60/bulto
Chile	Matate	200	-
	Lbs.	5,200	-
	Dozen	4,000	-
Lettuce	Bultos or Matates	300,120	-
Patate	Units	3,000	-
Snowpeas	Quintales	72	-
Tomatoes	Caja (50 Lbs.)	100	-

Lettuce - 2 dozen or 24 head in 1 matate
 Chile - 300 dozen in 1 matate
 Carrots - 25 dozen or 300 in 1 matate

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TABLE 12: COST OF PRODUCTION AND BENEFITS RECEIVED ON ONE MZ. OF MAIZ USING TRADITIONAL METHODS 1985. (Source: Extension Office, Soledad).

ITEM	COST (Lempiras)	
Land preparation (chop with machete & burn)	55	
Plant (planting holes)	10	
Cultivation	50	
Harvest	40	
	<u> </u>	
Total Labor Inputs		155
Seed (40 lbs @ L 0.20/lb)		
	<u> </u>	
		8
		<u> </u>
Total Purchased Inputs		8
Total Production Cost		<u>163</u>
Benefits (8qq @ L 20/qq)		<u>160</u>
		(3)

Note: In practice most labor is provided by family members and seed is saved from the previous crop, not purchased.
One Mz = 0.64 Ha.

TABLE 13: YIELD OF MAIZ OBTAINED ON FIVE FARMS IN CONCEPCION DE MARIA AREA USING IMPROVED AGRONOMIC TECHNIQUES. (Source: Extension Office, Concepcion de Maria).

MONTH PLANTED	ELEVATION (m)	SOIL SLOPE (%)	YIELD (qq/Mz)
5/85	400	45	12
6/85	290	40	20.2
6/85	400	45	24
6/85	370	25	42
5/85	390	35	27
Mean			<u>25</u>

Note: Inputs consisted of urea (150 lb/Mz @ L 30/qq), insecticide (L 18/Mz), organic fertilizer (400 qq/Mz), and chemical fertilizer (12-24-12, 1 qq/Mz @ L 30/qq).

TABLE 14: LA CEIBA II DEMONSTRATION. COST OF PRODUCTION AND BENEFITS RECEIVED ON ONE MZ OF MAIZ, IMPROVED AGRONOMIC TECHNIQUES, 1985. (Source: Extension Office, Soledad)

Item	Cost (Lempiras)
<u>Permanent Improvements:</u>	
Land clearing	100
Soil Conservation Work	180
Total Cost of Permanent Improvements	<u>280</u>
Annual Cost of Permanent Improvement (10% of Total)	28
<u>Crop Costs, Labor:</u>	
Land Preparation	25
Incorporate organic fertilizer	25
Apply granular soil insecticide	5
Planting (in contour furrow)	10
Aporque (a form of cultivation)	25
Apply insecticide	15
Harvest	50
Total Labor	<u>155</u>
<u>Crop costs, Non-labor inputs:</u>	
Seed (40 lb @ L 20/lb)	8
Organic fertilizer (400 qq @ L 0.50/qq)	200
Insecticide (Dipterex)	9.50
Nematacide (counter)	50
Total Non-labor inputs	<u>267.50</u>
Total Production Cost	<u>450.50</u>
Benefit (25 qq @ L 20/qq)	500.00
NET BENEFIT	<u>50.50</u>

TABLE 15: LA CEIBA I DEMONSTRATION. SUMMARY OF COST OF PRODUCTION ON ONE MZ OF MAIZ, IMPROVED AGRONOMIC PRACTICES, 1985. (Source: Extension Office, Soledad).

Item	Cost (Lempiras)
Annual Cost of Permanent Improvements	28
Total Labor Input	130
Total Non-Labor Inputs	<u>289.50</u>
Total Production Cost	447.50
Benefit (35 qq @ L 20/qq)	<u>700</u>
NET BENEFIT	252.50

Note: Labor costs are lower than in Table 14 because this is the second year that improved techniques have been used on this field; the soil is easier to work and labor has become more proficient in use of the new techniques.

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Based on the farmer interviews, the yield increases for corn production in the South are about 12 qq/manzana, an increase of 150%, or from 8 qq/mz before the adoption of improved practices, to 20 qq/mz after the adoption of improved practices. (Table 16). In the Cabeceras region (which would include Talanga), the corn yields increase from 17 qq/mz to 31 qq/mz, an increase of 14 qq/mz. Bean yields also increased in the Cabeceras from 7 to 33 qq/mz (Table 16). Potato yields also increased. Unfortunately due to lack of sufficient data, and due to time limitations in doing this evaluation, it was not possible to calculate the increased income value of beans, potatoes or grain sorghum, as a result of farmers' participation in the NRMP.

The amount of land planted to basic grains, using improved agronomic practices, is indicated in Table 17. As shown, the actual planted acreage was 2,292 hectares through 1985, and is projected to increase by 10,990 hectares in the 1986-88 period. Since all estimates at the farm level are in manzanas, the total acreage planted to basic grains using improved agronomic practices, is calculated to be 20,853 manzanas for 1983-88.

The data in Table 17 (and from previous tables) were used to calculate the yield and value added increases for corn (Table 18). As shown, the values added for the 1983-88 period due to adoption of NRMP recommended agronomic practices are estimated to be \$8,768,070 U.S. (see explanation in footnote "b" in Table 18).

TABLE 16: PRODUCTIVITY INCREASES AS RESULT OF TECHNICAL ASSISTANCE PROVIDED BY NATURAL RESOURCES MANAGEMENT PROJECT (qq/mz)

AREA	MAIZ (CORN)					
	NUMBER OF FARMERS REPORTING	YIELD BEFORE NRMP		NUMBER OF FARMERS REPORTING	YIELD AFTER NRMP	
		RANGE	AVERAGE		RANGE	AVERAGE
Entire South ^{a)}	19	2-24	8.0	15	5-40	20.0
Concep. de Maria ^{b)}	-	-	4.0	5	12-42	25.0
Cabeceras	10	4-40	17.0	19	8-80	31.0
Total Project ^{c)}	29	2-40	12.1	34	5-80	26.0

BEANS						
Cabeceras	4	3-20	7.1	8	5-96	33.0

POTATOES						
Cabeceras	4	8-80	44.5	5	32-80	62.4

- a) Based on farmer interviews
- b) Traditional yield is area-wide estimate by NRMP agronomist with three years local experience. Based on results of five demonstration plots planted on slopes of 25-45%. The yields ranged from 12-42 qq/mz, with the lowest yield corresponding to a very early planting which was affected by drought.
- c) Excludes 5 demonstration plots in Concepción de Maria.

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TABLE 17: AMOUNT OF LAND PLANTED TO BASIC GRAINS, FOR WHICH AGRONOMIC PRACTICES WERE APPLIED, BY SUBWATERSHED AND TOTALS WITH TECHNICAL ASSISTANCE PROVIDED BY NATURAL RESOURCES MANAGEMENT PROJECT 1983-85, AND PROJECTED TO 1988.
(Units in Hectares until converted to Manzanas)

<u>YEAR</u>	<u>CABECERAS</u>	<u>SOUTH</u>	<u>TALANGA</u>	<u>TOTAL</u>
1983	200.0	167.9	-	367.9
1984	149.0	577.0	-	726.0
1985	<u>311.7</u>	<u>886.5</u>	-	<u>1,198.2</u>
Subtotal	660.7	1,631.4	-	2,292.1
1986-88	<u>660.7^{a)}</u>	<u>1,631.4^{a)}</u>	<u>8,698.0^{b)}</u>	<u>10,990.1</u>
Total 1983-88	1,321.4	3,262.8	8,698.0	13,282.2
manzanas ^{c)}	2,074.6	5,122.6	13,655.9	20,853.1

Source: Data for 1983-85 and 1986 Talanga goal provided by NRMP office.

- a) Assumption is that as many hectares will be treated with agronomic practices in the 1986-88 period (3 years) as in 1983-85.
- b) The 1986 goal for Talanga subwatershed is 4,349 hectares. Since this is a new region in the NRMP, assumption is that only two times that amount will be treated with agronomic practices in the 1986-88 period.
- c) Converted on basis of 1.57 manzanas per hectare.

TABLE 18: YIELD AND VALUE ADDED INCREASES FOR CORN, BASED ON AGRONOMIC PRACTICES ADOPTED BY SMALL FARMERS IN THE NATURAL RESOURCES MANAGEMENT PROJECT, 1983-1988

YEAR	C A B E C E R A S					S O U T H			
	MANZANAS ADDED	CUMULATIVE mz.	YIELD INCREASE qq/mz.	TOTAL INCREASE qq.	VALUE ADDED TO FAMILY INCOME (Lps) ^{a)}	MANZANAS ADDED	CUMULATIVE mz.	YIELD INCREASE qq/mz	TOTAL INCREASE qq
1983	314	314	12	3,768	56,520	264	264	14	3,696
1984	234	548	12	6,576	98,640	906	1,170	14	16,380
1985	489	1,037	12	12,444	186,660	1,392	2,562	14	35,868
1986	346	1,383	12	16,596	248,940	854	3,416	14	47,824
1987	346	1,729	12	20,748	311,220	854	4,270	14	59,780
1988	346	2,075	12	24,900	373,500	854	5,124	14	71,736
Total	2,075	7,086	12	85,032	1,275,480 ^{b)}	5,124	16,806	14	235,284

Source: Based on data calculated in Table 17.

a) The average price received by small farmers for corn sold is Lps. 30 per carga or Lps. 15 per quintal. In reality, most of the corn produced is used for family consumption and is not sold. In addition, if the farm family must buy corn, it usually pays Lps. 38 per carga or Lps. 19 per quintal in the market place plus paying Lps. 2 per quintal for transportation. Thus, the value added by the increased production is based on a conservative estimate of Lps. 15/qq.

b) Total value added to family income for all three regions for period 1983-88 is 9,720,900 lempiras (1,275,480 + 3,529,260 + 4,916,160) or \$4,860,450 U.S. As indicated earlier, this is a very conservative estimate, and is based on one corn crop per year per farm. Some farmers, particularly those in the south and at lower elevations in the north are able to produce two corn crops per year. The yield increases per manzana also should be greater in 1986-88. Projecting the value added to family income for 1989-90, the additional income would be Lps. 7,815,240 (373,500 + 1,076,040 + 2,458,080 = 3,907,620 Lps/yr x 2 years = Lps. 7,815,240) or US\$3,907,620. Adding these two years to the 1980-88 total of \$4,860,450 results in \$8,768,070 total value added due to adoption of agronomic practices by small farmers in the NRMP, just for the corn crop.

T A L A N G A					
VALUE ADDED TO FAMILY INCOME (Lps.) ^{a)}	MANZANAS ADDED	CUMULATIVE mz.	YIELD INCREASE qq/mz.	TOTAL INCREASE qq	VALUE ADDED TO FAMILY INCOME (Lps.) ^{a)}
55,440	-	-	-	-	-
245,700	-	-	-	-	-
538,020	-	-	-	-	-
717,360	4,552	4,552	12	54,624	819,360
896,700	4,552	9,104	12	109,248	1,638,720
1,076,040	4,552	13,656	12	163,872	2,458,080
3,529,260 ^{b)}	13,656	27,312	12	327,744	4,916,160 ^{b)}

The amount of land planted to horticultural crops, using NRMP recommended agronomic practices, is shown in Table 19. A total of 1,211 manzanas is projected to be using such practice for producing horticultural crops by 1988. These data are used to calculate the value added to farm income from producing horticultural crops (Table 20). As calculated, the value added for the 1983-88 period is projected to be US\$676,400. Please note the detailed explanation for this calculation in the two footnotes in Table 20.

The estimated benefits accruing to NRMP farmers from forestry and agroforestry activities are presented in Table 21. All the estimates are made through 1990. Although there obviously were benefits from some of these activities accruing in 1983-88, it is difficult to make those calculations, given the limited data available. Therefore, the benefits are calculated as if the trees began producing such benefits beginning in 1986. The value added calculations are made for fuelwood, timber (polewood primarily), agroforestry (forage value) and the fertilizer contribution, primarily from the nitrogen fixing *Leucaena* trees. The reader may refer to the detailed calculations and footnotes in Table 21.

The fish tanks were only incorporated into the NRMP in 1985. Since there are many small farm families with protein deficiencies in their diet, the production of Tilapia and similar high protein fish. It is projected that 500 fish tanks will be constructed through the NRMP by 1990, resulting in a net value gain of \$180,450 for the 1985-90 period (Table 22).

TABLE 19: AMOUNT OF LAND PLANTED TO HORTICULTURAL CROPS, FOR WHICH AGRONOMIC PRACTICES WERE APPLIED, BY SUBWATERSHED AND TOTALS, WITH TECHNICAL ASSISTANCE PROVIDED BY NATURAL RESOURCES MANAGEMENT PROJECT 1983-85, AND PROJECTED TO 1988 (Units in Hectares until converted to Manzanas).

<u>YEAR</u>	<u>CABECERAS</u>	<u>SOUTH</u>	<u>TALANGA</u>	<u>TOTAL</u>
1983	48.0	0.0	-	48.0
1984	70.0	8.9	-	78.9
1985	<u>78.6</u>	<u>12.2</u>	<u>-</u>	<u>90.8</u>
Subtotal	196.6	21.1	-	217.7
1986-88	<u>196.6^{a)}</u>	<u>21.1^{a)}</u>	<u>336.0^{b)}</u>	<u>553.7</u>
Total 1983-88	393.2	42.2	336.0	771.4
manzanas ^{c)}	617.3	66.3	527.5	1,211.1

Source: Data for 1983-85 and 1986 Talanga goal provided by NRMP office.

- a) Assumption is that as many hectares will be treated with agronomic practices in the 1986-88 period (3 years) as in 1983-85.
- b) The 1986 goal for Talanga subwatershed is 168 hectares. Since this is a new region in the NRMP, assumption is that only two times that amount will be treated with agronomic practices in the 1986-88 period.
- c) Converted on basis of 1.57 manzanas per hectare.

TABLE 20: YIELD AND VALUE ADDED INCREASES FOR HORTICULTURAL CROPS, BASED ON AGRONOMIC PRACTICES ADOPTED BY SMALL FARMERS IN THE NATURAL RESOURCES MANAGEMENT PROJECT

<u>YEAR</u>	<u>MANZANAS ADDED</u>	<u>CUMULATIVE MANZANAS</u>	<u>VALUE ADDED PER MANZANA Lps.</u>	<u>TOTAL VALUE ADDED (Lps.)</u>
1983	75	75	400	30,000
1984	124	199	400	79,600
1985	143	342	400	136,800
1986	290	632	400	252,800
1987	290	922	400	368,800
1988	290	1,212	400	484,800
Total	1,212	3,382	400	1,352,800 ^{b)}

- a) Assumption is that for a mix of horticultural crops (tomatoes, carrot, cabbage, beets, lettuce and other specialty crops), the small farmer has been able to net, after all expenses including purchased inputs, an additional Lps. 200 per crop per manzana, based on yield increase of 50 to 100 percent for these crops. For example, the Lps. 200 can be obtained by selling only 4 more bultos of cabbage per manzana at Lps. 60 per bulito. The small farmer in the NRMP are averaging at least two crops per year per manzana, so the value added per manzana per year due to adoption of improved agronomic practices is at least Lps. 200 times 2 crops or Lps. 400/mz/yr. In reality, with irrigation, many of the NRMP farmers are harvesting and selling 3 to 4 crops per year. Before participation in the NRMP, and without irrigation, the small farmer was fortunate to sell one crop per year.
- b) Total value added during 1983-88 period is projected to be Lps.1,352 or US\$676,400. Adding two more years (1989-90) would provide an additional Lps. 969,600 (Lps. 484,800/yr x 2 yrs.) or US\$484,800. The total value added for 1980-90 thus is projected to be US\$1,161,200 (\$676,400 + \$484,800). This again is a conservative estimate since it assumes no additional land will be treated with agronomic practices in 1989-90 by the small farmers in the NRMP. It is almost certain that the small farmer will continue to improve the cultural practices in the small tracts of land after 1988.

TABLE 21: ESTIMATED BENEFITS OF NATURAL RESOURCES MANAGEMENT PROJECT IN HONDURAS, 1980-85, 1980-88, and 1980-90.

VALUE OF FORESTRY AND AGROFORESTRY

FORESTRY (PURE PLANTATIONS)		AGROFORESTRY
YEAR	HA	HA
1983	452	106
1984	414	61
1985	181	407
Totals	1,047	574

Source: NRMP Central Office

FUELWOOD CONTRIBUTION FROM PURE PLANTATIONS^{a)}

10 cubic meters/Ha/yr = 600 Kg./yr = 6 cargas/Ha/yr
(at average age of 2½ yrs)

YEAR	HECTARES	CARGAS PROD/HA	TOTAL PRODUCTION CARGAS	VALUE LPS/CARGA	TOTAL VALUE LPS
1986	1,047	6	6,282	3	18,846
1987	1,400	6	8,400	3	25,200
1988	1,800	6	10,800	3	32,400
1989	2,200	6	13,200	3	39,600
1990	2,600	6	15,600	3	46,800
			54,282	3	162,846

Value of Fuelwood 1980-90 = 162,846 Lps or \$81,423 U.S.

VALUE OF TIMBER FOR CONSTRUCTION

YEAR	HECTARES	POLEWOOD/HA ^{b)}	TOTAL TREES FOR POLEWOOD	TOTAL VALUE LPS. ^{c)}
1986	1,047	1750	1,832,250	366,450
1987	1,400	1750	2,450,000	490,000
1988	1,800	1750	3,150,000	630,000
1989	2,200	1750	3,850,000	770,000
1990	2,600	1750	4,550,000	910,000
				3,166,450

Value of Polewood=3,166,450 Lps or US\$1,583,225

- a) Source: Leucaena: Promising Forage and Tree Crop for the Tropics.
 b) Assuming trees planted 2 meters x 2 meters or 250 trees/ha and with 30% mortality, will have 1750 trees/ha.
 c) Assumes tree increases in value 20 centavos per year for polewood construction. Cordia alliodora- L1.00 per unit merchantable at 5 yrs. Remains this price until large enough to be sold for saw timber at 30+ cms. Eucalyptus- Probably same as for Cordia. Pine- In Cabeceras, probably same as for Cordia.

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TABLE 21 continued

FORAGE PRODUCTION IN AGROFORESTRY (ASSUMES 1,000 TREES/HA)

Each 10 trees provide 30 Kg of tree Forage per year

30 Kg Forage = .5 Kg weight gain on cattle

1,000 trees/ha - 10 = 100 x .5Kg or 50 Kg gain per Ha. per ye

YEAR	HECTARES	WEIGHT GAIN/HA	TOTAL WEIGHT	TOTAL VALUE L
1986	574	50	28,700	40,180
1987	774	50	38,700	54,180
1988	1,200	50	60,000	84,000
1989	1,600	50	80,000	112,000
1990	2,000	50	100,000	140,000
Total				430,360 _{b)}

a) Average cattle price when sold is 1.40 Lps/Kg.

b) Total forage production benefits 1980-1990=430,360 Lps or US\$215,180

FERTILIZER CONTRIBUTION*

Incorporating legume species into conservation practices as living barriers, approximately .1 Kg of N will be added to the soil per linear meter of legume barrier planted on one meter centers (in row) as recommended by NRMP. If living barriers are 10 meters apart, this is equivalent to 100 Kg/Ha/year. However, there is a high Nitrogen loss due to denitrification, especially when leaves are not immediately incorporated into the soil. Even when incorporated, only about 65% of the nitrogen in Leucaena is available for crop growth. Thus we conservatively assume 65 Kg on Nitrogen/Ha/yr from Agroforestry.

YEAR	HECTARES	NITROGEN Kg/Ha	TOTAL Kg/N	TOTAL VALUE LPS ¹⁾
1986	574	65	37,310	44,772
1987	774	65	50,310	60,372
1988	1,200	65	78,000	93,600
1989	1,600	65	104,000	124,800
1990	2,000	65	130,000	156,000
Total				479,544 ²⁾

*Source: Chenkanna, N. G. "Nitrogen, Phosphate and Potash status of some coffee soils in South India and manuring of coffee." Planter's Chronicle pp 1-9, 1950

1) Urea, which is 46% N costs 60 Lps/100Kg. The green manure value of Leucaena leaves should be worth at least 120 Lps/100 or 1.20 Lempiras per Kg.

2) The total value of the fertilizer contribution of agroforestry is 479,544 Lps or US\$239,272 for the period 1980-1990.

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TABLE 22: ESTIMATED VALUE OF FISH TANKS CONSTRUCTED WITH ASSISTANCE OF NATURAL RESOURCES MANAGEMENT PROJECT, 1985-90. ALL SUBWATERSHEDS (U.S. DOLLARS)

YEAR	NUMBER	VALUE ^{a)}
1985	3	450
1986	50	7,500
1987	100	15,000
1988	200	30,000
1989	350	52,500
1990	500	75,000
Totals	-	\$180,450

a) Based on 300 Lbs. production per crop per tank and net value gained (after expenses) of 1 Lp/Lb = Lps.300/tank/yr or US\$150/tank/yr.

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TABLE 23: ESTIMATED VALUE OF ABONERAS (ORGANIC FERTILIZER COMPOSTS) CONSTRUCTED WITH ASSISTANCE OF NATURAL RESOURCES MANAGEMENT PROJECT, 1985-1990, ALL SUBWATERSHEDS (U.S. DOLLARS)

YEAR	NUMBER	VALUE ^{a)}
1985	43	\$ 3,225
1986	60	4,500
1987	90	6,750
1988	120	9,000
1989	150	11,250
1990	180	13,500
Totals	-	\$ 48,225

a) Each 2mx2mx2m abonera is projected to yield about 5qq of organic fertilizer valued at Lps.30/qq = Lps.150 or US\$75 per abonera. 43 abonerass x Lps.150/abonerass = Lps.6,450 or US\$3,225.

Calculations were made to estimate the value of aboneras or organic fertilizer composts. As indicated in the farmer surveys, 43 of 92 NRMP farmers had built aboneras through the NRMP by 1985 (Table 23). Since there was no way to extrapolate this figure from the survey to the total number of farm families in the NRMP, we only felt comfortable using this figure as a base. Hopefully, many more farmers have aboneras than the number we used. The projected 1985-90 benefits (fertilizer value or savings in not having to buy chemical fertilizer) are projected to be U\$48,225.

It is especially difficult to calculate a value for family gardens and fruit trees planted around the home. The women in the project, and the children deserve much of the credit for these activities. The planting and consumption of vegetable crops and various fruits certainly improves the diet of the family, and reduces the need to make such food purchases in the market place. In 1985, the NRMP Central office reported that 910 of 3,577 families (about 25%) in the Project had planted fruit trees (and/or had family gardens). This percentage has been used to extrapolate data to 1990. As indicated in Table 24, the estimated total value of these activities is US\$2,022,300 for the 1983-1990 period.

The value of training both NRMP Central office and Extension Agency personnel, and the value of technical training received by the family members (women, men, and children) of those participating in the NRMP, is a significant component of this AID technical assistance project. Research studies by

TABLE 24: ESTIMATED VALUE OF FAMILY GARDENS (VEGETABLES AND FRUIT TREES) AROUND HOMES, AS RESULT OF PARTICIPATION IN NRMP.

(U.S.DOLLARS)

<u>YEAR</u>	<u>NUMBER OF GARDENS^{a)}</u>	<u>VALUE PER YEAR^{b)}</u>	<u>TOTAL VALUE</u>
1983	200	\$ 180	\$ 36,000
1984	750	180	135,000
1985	910	180	163,800
1986	1,300	180	234,000
1987	1,700	180	306,000
1988	2,125	180	382,500
1989	2,125	180	382,500
1990	<u>2,125</u>	<u>180</u>	<u>382,500</u>
Totals	-	-	\$2,022,300

a) Based on a 25% participation rate of all farm families involved in the NRMP.

b) Estimated value of fruits and vegetables (and some flowers) for family consumption and/or for sale is US\$15 per month or US\$360 per year.

Luther Tweeten at Oklahoma State University, Earl Heady at Iowa State, and other researchers strongly indicate that the dollars invested in research and extension activities, including training activities, have a multiplier effect of 5 to 10 times the initial investment. Those studies also indicate a return on investment, based on increased earning capacity due to training, of 3-5 times the cost of such training. Since it is extremely difficult to find results of studies on investments in training in developing countries, a set of very conservative figures for annual value of training has been used in Table 25. As indicated, the estimate for 1980-85 is \$8,429,034,150,000 for 1980-88; and, \$46,400,000 for 1980-90. There is no way to place a value on the political stability, economic security, and emotional stability of the country and its people from training such as that provided by the AID technical assistance project.

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TABLE 25: ESTIMATED BENEFITS FOR NATURAL RESOURCES MANAGEMENT PROJECT IN HONDURAS
1980-85, 1980-88, and 1980-90

(U.S.DOLLARS)

<u>INCREASED VALUE OF PERSONNEL TRAINED 1980-85</u>					
<u>Group</u>	<u>Number Trained</u>	<u>Years Trained</u>	<u>Total Years Trained</u>	<u>Training Value per Year</u>	<u>Total Value</u>
NRMP Central Office	25	3	75	\$ 5,000	\$ 375,000
NRMP Field Personnel	150	2	300	3,000	900,000
Farmers trained (includes women)	3,577	2	7,154	1,000	7,154,000
Subtotal					\$8,429,000
<u>INCREASED VALUE OF PERSONNEL TRAINED, 1980-88</u>					
NRMP Central Office	30	5	150	\$ 5,000	750,000
NRMP Field personnel	200	4	800	3,000	2,400,000
Farmers trained	8,500 ^{a)}	2-4 ^{b)}	31,000	1,000	31,000,000
Subtotal					\$ 34,150,000
<u>INCREASED VALUE OF PERSONNEL TRAINED, 1980-1990</u>					
NRMP Central Office	30	6	180	\$ 5,000	900,000
NRMP Field personnel	200	5	1,000	3,000	3,000,000
Farmers trained	8,500	5	42,500	1,000	42,500,000
Subtotal					\$ 46,400,000

a) Assumes NRMP will reach goal of 7,000 farm families in original subwatersheds plus 1,500 farm families in Talanga subwatershed.

b) Assumes 7,000 families will have participated in NRMP and received training an average of 4 years and 1,500 farm families in Talanga subwatershed will have received an average of 2 years training.

ESTIMATED BENEFITS FOR THE NATURAL RESOURCES
MANAGEMENT PROJECT IN HONDURAS AND CALCULATIONS
OF BENEFIT-COST RATIOS

A summary table of estimated benefits for the Natural Resources Management Project was developed, to aggregate all the benefits from previous tables. As presented in Table 26, benefits were calculated for three different time periods. For purposes of calculating benefit cost ratios, only the 1980-88 and 1980-90 data will be used. Total estimated benefits for 1980-88 are \$44,933,935, and for 1980-90, the estimated benefits are \$66,949,845.

As presented and discussed earlier (Table 8), the relevant cost figure to use in calculating a Benefit-Cost ratio for the NRMP project is \$18,075,500. Thus, the ratios can be calculated as follows:

$$1980-88 \quad \frac{B}{C} = \frac{\$44,933,935}{\$18,075,500} = \frac{2.49}{1.00}$$

$$1980-90 \quad \frac{B}{C} = \frac{\$66,949,845}{\$18,075,500} = \frac{3.70}{1.00}$$

A slightly different way to develop the Benefit-Cost ratio for the Project is to use the 1980-90 benefits shown in Table 26, less the value of the training component. This estimate would be \$20,549,845 (\$66,949,845 - \$46,400,000), that figure can be added to the present value of the discounted annual benefits of the Project projected for 25 years at a real discount rate of 6% (See footnotes on Table 27). The 1990 annual benefits are estimated to be \$4,947,930 U.S. The present value

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TABLE 26: ESTIMATED BENEFITS FOR NATURAL RESOURCES MANAGEMENT PROJECT IN HONDURAS, 1980-85. PROJECTED 1980-88, AND PROJECTED 1980-1990.
(U.S. DOLLARS)

CATEGORY	1980-85	1980-88	1980-90
Personnel trained	\$8,429,000	\$34,150,000	\$46,400,000
Soil saved	553,056	2,943,360	6,250,000
Family gardens ^{a)}	334,800	1,257,300	2,022,300
Forestry	-	970,000	2,119,600
Agronomic Practices ^{b)}			
Corn	535,050	4,860,450	8,768,070
Horticulture	123,200	676,400	1,161,200
Organic Fertilizer ^{c)} (aboneras) ^{d)}	3,225	23,475	48,225
Fish Production ^{e)}	450	52,950	180,450
Pasture Improvement	-	-	-
Totals	\$9,978,781	\$44,933,935	\$66,949,845

- a) Forty-four of the 92 small farm families interviewed had family gardens (vegetables and/or fruit trees) around the home. However, only about one-half of these had been initiated after the farm family began participating in the project. It is estimated that each family garden can yield Lps. 30/month or Lps. 360/year (US\$180/yr) in consumable and marketable food and flowers. Only about 25% of the NRMP participants (or 910 of 3,577) had fruit trees planted through the NRMP in 1985. Based on this participation rate, the number of families with family gardens through the NRMP is estimated at 910 in 1985, 2,125 in 1988, and 2,125 in 1990.
- b) No value has been assigned to the value of increased production of other basic crop, such as beans, maicillo (grain sorghum) and potatoes. Small farmers in the NRMP did report increased yields in these crops; however, it is difficult to quantify acreage and production increases of crops primarily produced for home consumption and/or harvested over extended periods of time (beans and maicillo).
- c) NRMP participants interviewed had built 43 aboneras (organic fertilizer composts) by 1985. Each aboneras (2mx2mx2m) is projected to yield 5 qq of fertilizer valued at Lps. 30/qq or Lps. 150/per abonera. 43 aboneras x Lps. 150 = Lps. 6,450 or \$3,225. The total number of aboneras actually constructed surely exceeds the 43 in the sample; however for estimation purposes, we used this conservative number and projected from that part.
- d) Three fish tanks were constructed in 1985. Each tank, covering about 300m², can produce about 300 pounds of Tilapia per crop, Tilapia is a high protein edible fish. The increased net value of each crop (after cost of production) is estimated at Lps. 1/lb. or Lps. 300 or US\$150 per tank per crop. The 1986 goal for Talanga subwatershed only is 46 fish tanks while the 1985 goal for the other subwatersheds was 7 fish tanks. It is estimated that 50 fish tanks will be in operation in 1986; 100 in 1987; 200 in 1988; 350 in 1989, and 500 by 1990.
- e) No attempt has been made to estimate the value of improved pastures through additional weight gains on beef animals or additional milk production of dairy animals, or improved fitness of oxen used for farm work. Obviously, the value of improved pastures will increase significantly over the life of the project as the small farmers are able to obtain more animals.

of this amount received each year for 25 years using the 6% discount rate is \$63,234,545. The footnotes in Table 27 describe the procedure.

Adding the \$63,234,545 to the \$20,549,845 benefit value for 1980-90 without training (from Table 26) provides \$83,784,390 total estimated benefits accruing to the Project for the 1980-2015 time period.

Thus a new Benefit-Cost ratio can be calculated as follows

$$\frac{B}{C} = \frac{\$83,784,390}{\$18,075,500} = \frac{4.63}{1.00}$$

This is a highly favorable B/C ratio for an AID technical assistance project. It needs to be emphasized that there are many other benefits occurring in Honduras because of the NRMP which are not quantified in this evaluation. The reduction in sedimentation damage to the estauries and mangrove swamps which provide vital habitat for shrimp and other aquatic habitat is invaluable. Similarly, there is less sediment in rivers and creeks, which reduces their flood carrying capacity. The beauty of the hillsides with reforestation and terraces, and the beauty of clean rivers and other benefits.

TABLE 27: NET PRESENT VALUE OF FUTURE STREAM OF ANNUAL BENEFITS
EMANATING FROM NATURAL RESOURCES MANAGEMENT PROJECT FOR
25 YEAR PERIOD, 1991-2015 ^{a)}
(U.S. DOLLARS)

<u>CATEGORY</u>	<u>1990 ANNUAL BENEFITS</u>
Soil saved	\$ 1,653,320 ^{b)}
Family gardens	382,500
Agronomic Practices	
Corn	1,953,810
Hortalizas	243,400
Forestry	
Fuelwood	23,400
Timber	455,000
Forage	70,000
Fertilizer	78,000
Aboneras	13,500
Fish production (in tanks)	75,000
Pasture Improvement	-
Total 1990 Benefits	\$ 4,947,930
PV Discounted for 25 yrs ^{a)}	\$ 63,234,545 ^{c)}

- a) Since these projections are made to show long lasting benefits of USAID funds invested in permanent natural resources improvements on small hillside farms in Honduras, it seems appropriate to use a U.S. derived discount rate for the calculations. The current (as of February 1986) prime interest rate in the U.S. is 9.5% and the current annual rate of inflation is approximately 3.5%, based on the 1985 increase in the CPI. Thus, the interest or discount rate for determining the real rate of return is 6.0% (9.5-3.5). The Present Value factor for 1 received each year for 25 years at 6.0 percent is 12.78.
- b) The estimated annual benefits for the value of soil saved in 1990 was calculated as follows. The increase in total value of soil saved between 1980-90 and 1980-88 is estimated at \$3,306,640 (\$6,250,000-\$2,943,360) for the additional two years. Dividing this figure by 2 yields \$1,653,320 for the year 1990 (see Table 10).
- c) It should be noted that this value does not include any estimated benefits from the training component of the project (personnel trained through the NRMP).

VIII RECOMMENDATIONS FOR PHASE II ACTIVITIES

Phase II is not seen as a radical departure from the current project and its extension. Rather, Phase II should provide the opportunity to consolidate and extend the natural resource management capabilities gained, achieving many of the goals originally visualized in the Project Paper. A number of specific recommendations have been made throughout the text of this evaluation for either the project extension or Phase II. When and whether such activities are actually implemented is a function of the actual progress of the project and the judgement of project managers.

Approximately 1 percent of the agricultural land in the target watersheds (85,800 ha.) has received conservation treatment as of the end of 1985. More farmers will be reached during the remaining years of the project. However, it is clear that if the intention is to create a national scale program, then all means possible should be sought to multiply the effectiveness of the limited staff and budget. Recommended actions and policy directions are discussed below:

1. Training. Already discussed are the recommendations that a strong program of paid para-technicians be developed and that the use of subsidies be deemphasized and focused as described. This implies an expanded program of training - (a) at the BS/MS level for professionals in agricultural sciences, (b) in extension, principally in how to train and backstop para-technicians

and in the application of various conservation and production technologies at the farm system scale, and (c) for paratechnicians themselves.

2. Coordination. There is a tendency for the Honduran government, AID and other donors to fund and implement highly complementary projects with little or no coordination. Now and in Phase II the NRMP should make a concerted effort to multiply its effectiveness by drawing on the resources of other projects. For example, the Rural Technologies project is attempting to introduce appropriate technologies in rural areas. Such efforts, large piecemeal, would be more effective if coordinated with overall extension programs of NRMP. Similarly, a major irrigation project being considered for AID funding will have a micro irrigation systems component, an activity highly complementary with NRMP. Other programs in tilling, integrated pest management, credit, and marketing can be drawn upon to achieve the vertical integration recommended by this evaluation.
3. Downstream beneficiaries. The NRMP has emphasized erosion control and downstream sedimentation and flooding control only in the abstract. A capability to deliver such services would be highly attractive to institutions concerned with water supply for irrigation, potable water supply and energy generation. Financing institutions such as the InterAmerican Development Bank are beginning to realize that investment in watershed

management are essential if anything approaching an acceptable useful life is to be achieved for the reservoirs it finances. Direct involvement with water projects could provide a major source of future funds for expanding the outreach of the NRMP. This will require building the credibility of the NRMP as a watershed management program as well as a successful hillside agriculture program. This will require a greater emphasis on upper watershed and stream corridor management, screening of watershed for critical sediment source areas as well as on farm erosion control.

4. Private Voluntary Organizations. The NRMP can further multiply its outreach by providing technical assistance and training to PVOs such as the Vermont Partners, World Neighbors, Rotary International, and others. Generally these groups have funding for such support. Given the magnitude of the resource deterioration problems, PVOs are valuable allies, not competitors.

APPENDICES

APPENDIX 1

PERSONS INTERVIEWED
CENTRAL NRMP OFFICE

APPENDIX 1
PERSONS INTERVIEWED
CENTRAL NRMP OFFICE

Introduccion:	Carlos Rivas, Ramón Serna, Paul Dulín
Horticultura:	Ing. Juan Anay Vallecillo
Ganaderia y Manejo de Pastos:	Ing. Humberto Gaekel Dr. Rafael Ledezma
Conservacion de Suelos y Aumento de la Productividad:	Ing. Reniery Ing. Frederick Tracy*
Agraforesteria y Reforestacion:	Ing. Isaac Abastida Ing. Sigfrido Salgado
Promocion Extension Capacitacion:	Ing. Peter Hughes-Hallett*
Piscicultura:	Ing. Manuel Paz

APPENDIX 1
PERSONS INTERVIEWED
CENTRAL NRMP OFFICE

Monitoreo y Calidad de Aguas:

Ing. Peter Hearne*

Anne Lewandowski*

Economía del Hogar:

Lic. Elsa Victoria Lopez

*Denotes Chemonics staff.

Names of People Interviewed by
1986 NRMP Evaluation Team

Olman Rivera	Supervisor, Southern Region
Julio Aguilar	Supervisor, Southern Region
Bonifacio Sanchez	Supervisor, Cabeceras Region

AID Personnel

John Warren, Project Manager, NRMP, Office of Rural Development
Julio Zepeda, Office of Rural Development

Partners for the Americas, Vermont Project

John Chater, Country Director
Enrique Maradiaga, Project Coordinator
Paulino Galvez, Recursos Naturales, Sabanagrande
John O'Brien, Peace Corps
Larry Bell, agroforestry Consultant
Balbino Andino, Promoter
Gabino Orolonez, Promoter
Norma Reyes, Promotora

Other Agency Personnel

Juan Blas Zapata, Gerente de Bosques, CONDEFOR
Jose Luis Segovia, SANAA

Other Agency Personnel

Jaime Lanza, Sub-Director, Recursos Hidricos

Roberto Rivera Lanza, Director, Recursos Hidricos

Rodolfo Stechmann Andino, Ex. Dir., National Cadaster

Francisco A. Funes Castro, National Cadaster

Victor Hugo Castro, National Cadaster

Extension Personnel Interviewed in the Following Field Offices:

Jutiapa

El Triunfo

Soledad

Tatumbia

Santa Lucia

San Buenaventura

Ojojona

Namasigue

Concepcion de Maria

Yusguare

Orocuina

APPENDIX 2

STEARMAN
APPENDIX

- A. Women in Development--Interview Guide
- B. Documents Consulted (not in alphabetical order)

1. Ha estado Ud. visitado por la promotora social de Recursos Naturales?
Desde cuando se iniciaron las visitas?
Cuántas veces por mes viene?
Cuándo fue la última visita?
2. Ha recibido algún beneficio de esta(s) visita(s)?
Cuáles son?
3. Pertenece Ud. a algún grupo femenino con Recursos?
Cuántas mujeres pertenecen a su grupo?
4. Es esta el primer grupo al cual ha pertenecido Ud.?
A cuál otro perteneció antes? (CARITAS, CARE, Iglesia, etc.)
5. Cuáles son los proyectos que ha cumplido con recursos?
(Deje la mujer nombrar primero. Entonces, nombre las áreas abajo que ella no ha nombrado)
 - a) Estufa mejorada (LORENA)
 - b) huerta familiar
 - c) conservación de suelos
 - d) sembrar árboles
 - e) conservación de comidas
 - f) mejoramiento de vivienda
 - g) proyectos pequeños (industriales)

- h) animales menores
- i) lactario infantil
- j) letrina
- k) otro

Como fue el resultado? (de cada proyecto) (aqui, si es posible, vaya a ver los proyectos que se han realizado).

6. (Si tiene estufa mejorada, pregunta lo siguiente:)

Le gusta la estufa nueva? Por que?

Ha tenido algun problema con la estufa?

Cual? Como se podria remediarla?

Ha visto que gasta menos lena?

Cuanta lena gastaba antes de tener la estufa? (cargas, lenas)

Cuanta lena gasta ahora?

7. Hay otras cosas o proyectos que quisiera aprender?

8. Cuales son las necesidades o problemas mas severos que tiene su familia?

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APPENDIX 3

Evaluation Questionnaire

EVALUACION
PROYECTO MANEJO DE RECURSOS NATURALES
Rfo Choluteca

Día: _____
_____ DE ENERO DE 1986

SOCIO _____
Comité

INDEPENDIENTE _____

I. GENERALES

Nombre: _____ Municipio: _____

Sede del Equipo: _____ Estado Civil: _____

_____ Cuando comenzó con el Proyecto? _____

Edad: _____

No. de hijos y edades _____ No. de parcelas cultivadas y total en
manzanas: _____

Pendiente de la Tierra: _____ % Tipo de Suelos: _____

Duero de la tierra: _____ Tierra Alquilada: SI _____ NO _____

Otro arreglo de tenencia: _____

II. CULTIVOS

1. Cuando empezó usted la siembra de cultivos no-tradicionales, tales como las hortalizas:

a. Antes de su participación en este Proyecto? SI _____ NO _____

b. Después de su participación en este Proyecto? SI _____ NO _____

2. Cuál ha sido su experiencia en la producción de estos cultivos, así como los cultivos tradicionales, desde que usted empezó a recibir asistencia del Proyecto?

<u>Cultivo</u>	<u>ANTES DEL PROYECTO</u>				<u>DESPUES DEL PROYECTO</u>				
	<u>Area Sembrada (Mz)</u>	<u>Varietades Sembradas</u>	<u>Fecha de Siembra</u>	<u>Fecha de Cosecha</u>	<u>Producción (Total)</u>	<u>Area Sembrada (Mz)</u>	<u>Varietades Sembradas</u>	<u>Fecha de Siembra</u>	<u>Fecha de Cosecha</u>

PRIMERA

POSTRERA

3.a. Tiene trabajadores que le ayudan en sus cultivos?

SI _____ NO _____ CUANTOS? _____

3.b. Cuántos días se trabaja durante el año? _____ (Total)

4. Qué salarios reciben por día? _____

5. En qué lugar venden su cosecha? _____

6.a. Cómo transportan sus cosechas al mercado? _____

6.b. Cuánto paga por transporte? _____

7. Generalmente cómo vende sus cosechas?

_____ A un mayorista _____ Directamente a la gente

8. Qué cultivos están intercalados? (asociados o juntos)

<u>CULTIVOS</u>	<u>AREA (MZ)</u>	<u>RENDIMIENTOS</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

9. Qué porcentaje (o cantidad) de sus cultivos o hortalizas se usan para su propio consumo?

<u>CULTIVO:</u>	<u>PORCIENTO:</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

10. Qué porcentaje (o cantidad) de sus cultivos o hortalizas se venden?

<u>CULTIVO</u>	<u>CANTIDAD</u>	<u>ADONDE SE VENDEN</u>	<u>QUE DIA LOS VENDE</u>	<u>QUE PRECIOS RECIBE</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

11. Ha perdido toda su cosecha alguna vez?

SI _____ NO _____ CULTIVO: _____ CUANDO: _____

Ha cambiado su cultivo a consecuencia de dichas pérdidas? SI _____ NO _____

EXPLIQUE _____

12. Tiene usted un sistema de riego? SI _____ NO _____ AREA _____ Mzs.

<u>CULTIVOS BAJO RIEGO</u>	<u>AUMENTO EN PRODUCCION DEBIDO AL RIEGO</u>	<u>AREA DE CULTIVO BAJO RIEGO (MZ)</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

13. Favor de describir su sistema de riego.

<u>EQUIPO</u>	<u>TAMANO/NUMERO</u>	<u>UNIDAD</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

14. Ha construido una pila (tanque de agua)? SI _____ NO _____

Propósito de la Pila? _____ Riego
_____ Consumo de animales
_____ Uso en la casa

15. Construyó su sistema de abastecimiento de agua con la ayuda del Proyecto?

SI _____ NO _____ AÑO CONSTRUIDA _____

III. ASPECTOS SOCIALES

1. Han participado miembros de su familia en clubes de amas de casa?

SI _____ NO _____

2. Han recibido algunos beneficios de estos clubes?

SI _____ NO _____

EXPLIQUE _____

3. Continúan practicando las prácticas recibidas?

SI ___ NO ___ PORQUE _____

4. Tiene estufa mejorada en casa? SI _____ NO _____

5. Prefiere la estufa mejorada o la estufa vieja?

_____ PREFIERO LA NUEVA _____ PREFIERO LA VIEJA

6. Utiliza menos leña la estufa nueva? SI _____ NO _____

7. Tiene letrina? SI _____ NO _____ AÑO CONSTRUIDA _____

Construyó letrina a consecuencia del Proyecto? SI _____ NO _____

8. Tiene huerto familiar? SI _____ NO _____

9. Lo sembró con la ayuda del Proyecto? SI _____ NO _____

10. Qué cultivos tiene el huerto?

11. Ha sembrado árboles frutales con la ayuda del Proyecto? SI ___ NO ___

VARIEDAD _____ NUMERO _____

VARIEDAD _____ NUMERO _____

VARIEDAD _____ NUMERO _____

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IV. Aspectos Forestales

NOTA: Es importante no leer todas las listas de opciones al agricultor. Se emplea este formulario unicamente para señalar sus contestaciones a las preguntas.

1.0 Existen árboles naturales individuales asilados en la propiedad?

SI _____ NO _____ ESPECIES: _____

1.1 Existe una extensión de bosque natural en la propiedad?

SI _____ NO _____ ESPECIES _____

1.2 Cuál es la extensión total del bosque natural en la propiedad?

_____ manzanas

1.3 Cuál es la superficie del bosque natural que se corta cada año?

_____ manzanas

1.4 Cuál es el uso que se le dá al bosque?

	<u>Diámetro mínimo de Aprovechamiento</u>	<u>Producción</u>	<u>Precio de Venta</u>	<u>Periodo de Producción (Meses)</u>
as p. aserrfo:	_____ cm	_____ por día _____ semana	mes año	L _____
as sierra a mano:	_____ cm	_____ por día _____ semana	mes año	L _____
tes de Cerco:	_____ cm	_____ por día _____ semana	mes año	L _____
strucciones ísticas:	_____ cm	_____ por día _____ semana	mes año	L _____
i:	_____ cm	_____ por día _____ semana	mes año	L _____
ón vegetal:	_____ cm	_____ por día _____ semana	mes año	L _____
na:	_____ cm	_____ por día _____ semana	mes año	L _____
no verde:	_____ cm	_____ por día _____ semana	mes año	L _____

	<u>Diámetro mínimo de Aprovechamiento</u>	<u>Producción</u>	<u>Precio de Venta</u>	<u>Perfodo de Producción (Meses)</u>
Forrage p. animales:	_____ cm	por día semana	mes año	L _____
Sombra p. animales:	_____ cm	por día semana	mes año	L _____
Sombra p. cosechas:	_____ cm	por día semana	mes año	L _____
Frutas comestibles:	_____ cm	por día semana	mes año	L _____
Otros usos:	_____ cm	por día semana	mes año	L _____

1.5 Se hace el aprovechamiento forestal del bosque en la propiedad conforme a unas técnicas científicas, como el corte selectivo, el raleo, o el entresaca?

SI _____ NO _____

1.6 Cuáles son las técnicas que se aplican en el bosque natural de la propiedad? Dichas técnicas son un resultado del asesoramiento del Proyecto?

<u>PRODUCTO</u>	<u>ESPECIES</u>	<u>TECNICA</u>	<u>AÑO DEL INICIO</u>	<u>ASESORAMIENTO DEL PROYECTO</u>	
				<u>SI</u>	<u>NO</u>
Trozas	_____	_____	_____	_____	_____
Postes	_____	_____	_____	_____	_____
Construcciones Domésticas	_____	_____	_____	_____	_____
Lena	_____	_____	_____	_____	_____
Carbón Vegetal	_____	_____	_____	_____	_____
Resina	_____	_____	_____	_____	_____
Abono Verde	_____	_____	_____	_____	_____
Forraje	_____	_____	_____	_____	_____
Frutas Comestibles	_____	_____	_____	_____	_____
Otros	_____	_____	_____	_____	_____

1.7 Dónde pastorean su ganado?

Dentro de la propiedad? _____ Estación: _____

En otras propiedades? _____ Estación: _____

Libremente en el bosque? _____ Estación: _____

Pastorean los animales de otros en su propiedad? _____ Estación: _____

1.8 Se practican quemas en el área del pastoreo de sus animales, o en su propiedad?

SI _____ NO _____ MES _____

1.9Cuál es la fuente de la leña para su consumo doméstico? Cuáles son las especies utilizadas?

De la misma propiedad: _____ ESPECIES _____

De la vecindad: _____ ESPECIES _____

Comprado: _____ ESPECIES _____ PRECIO: L _____ / _____

1.10 Cuánto es el consumo de leña para su uso doméstico?

_____ cargas por día _____ semana _____ mes _____ año _____

2.1 Ha plantado árboles en su propiedad? SI _____ NO _____

2.2 Cuáles han sido los tipos de plantación en la propiedad?

<u>Tipo</u>	<u>Especies</u>
Bloques de plantación p. prodn. de madera: _____	_____
Rompevientos: _____	_____
Deslinde: _____	_____
Cercos vivos: _____	_____
Barreras Vivas: _____	_____
Abono Verde: _____	_____
Alimento p. animales: _____	_____
Sombra p. ganado: _____	_____

Sombra p. cosechas: _____
 (café, etc.) _____

Frutales: Huerta: _____

Ornamentales: _____

Otros: _____

2.3 Cuáles fueron los propósitos de establecer dichas plantaciones en la propiedad?

<u>Propósito</u>	<u>Especies</u>	
Prod. p. ingresos personales _____	_____	_____
Protección (viento, sombra) _____	_____	_____
Conservación del suelo (movimiento del agua) _____	_____	_____
Mejoramiento del Suelo (Fertilidad, etc) _____	_____	_____
Forraje para animales _____	_____	_____
Sombra para cosechas _____	_____	_____
Sombra para animales _____	_____	_____
Frutas Comestibles _____	_____	_____
Ornamentales _____	_____	_____
Otros _____	_____	_____

2.4 En cuál clase de plantación recibió usted el asesoramiento técnico?

<u>Tipo de Plantación</u>	<u>Años de la Plantación</u>	
Bloques de plantn. p. producir madera p. venta	_____	_____
Rompevientos	_____	_____
Deslinde	_____	_____
Cercos vivos	_____	_____
Barreras vivas	_____	_____
Abono verde	_____	_____
Alimento p. animales	_____	_____
Sombra p. animales	_____	_____
Sombra p. cosechas (café, etc.)	_____	_____
Frutales, huerta	_____	_____
Ornamentales	_____	_____
Otros tipos	_____	_____

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3. Emplea usted a otras personas para producir leña?

SI _____ NO _____ CUANTAS _____

V. MANEJO DE PASTOS

1. Cuántos animales tiene?

	<u>Hoy en día</u>	<u>Hace dos años</u>
Bueyes	_____	_____
Ganado	_____	_____
Bestias	_____	_____

2. Ha sembrado pastos de corte? SI _____ NO _____

Qué variedades?

	<u>Mz</u>	<u>Cuándo Siembra</u>	<u>Cuándo Cosecha</u>
King Grass	_____	_____	_____
Pasto Guatemala	_____	_____	_____
Cana de Azúcar	_____	_____	_____
Otros	_____	_____	_____

3. Qué importancia tiene este pasto para engordar vacas? _____

Cuánto pasto de corte está produciendo cada año? _____

4. Ha sembrado pastos mejorados? SI _____ NO _____

Estrella Africana Mz _____

Kikuyu Mz _____

Jaragua Mz _____

Cuánto cuesta este pasto? _____

5. Desde que inició el programa de mejoramiento de pastos, qué resultados ha recibido?

Cómo ha variado el peso de los animales? _____

Cómo ha variado la producción de leche? _____

VI. OBRAS DE CONSERVACION DE SUELOS

1. Ha construido estructuras tales como muros de piedra, asequfas de ladera u otras mejoras en su finca para el control de la erosión?

SI _____ NO _____

<u>ANO</u>	<u>TIPO DE MEJORA</u>	<u>LARGO/CANTIDAD</u>	<u>UNIDAD</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. Recibió usted alguna ayuda del Proyecto para la construcción de estas mejoras?

SI _____ NO _____ CREDITO _____ INCENTIVO _____

3. Ha visto algún beneficio de estas mejoras?

EXPLIQUE _____

4. Hace abonera? SI _____ NO _____

Cuando la hizo? _____ De qué tamaño? _____

La está usando como fertilizante? SI _____ NO _____

En qué cultivos? _____

Qué beneficios recibe? _____
