PD-AAF-798
5250216 ①

**********
*5250216 PANAMA *
* MANAGED FISH PRODUCTION *
* FY80 TO FY83 *
**********

***PROJECT SUMMARY DESCRIPTION***

Grant is provided to the Government of Panama (GOP) to study the feasibility of developing large-scale freshwater fish production projects. The National Aquaculture Directorate (DINAAC) of the Ministry of Agricultural Development (MIDA) will implement the project with long-term U.S. technical assistance.

Twenty demonstration ponds will be set up (mostly as upgradings of existing ponds) under various technological and institutional mixes to facilitate comparisons between alternative approaches, e.g., community fingerling production, the use of production cooperatives to obtain credit for pond projects, etc. Pond sites will be selected on the basis of area nutritional need; community interest; adequacy of potential sites; and location and access. To permit an increase in fish production/varieties, 50 additional ponds and related infrastructure such as hatchery and laboratory facilities will be constructed.

Using baseline data from the demonstration projects, three feasibility studies will be conducted at the household, community, and fish pond project levels, as follows: (1) a program effectiveness study will evaluate the project's social and administrative feasibility, with emphasis on the project's community outreach capabilities; (2) a consumption impact study will monitor the project's nutritional impact on local villages by means of a 24-hour dietary recall survey taken before and during the project; and (3) an economic/financial study will assess the rural poor's ability to participate in the program.

The DINAAC's Technology Transfer Department (TTD) will be expanded to improve its aquacultural capabilities. Two staff positions will be created, including that of a Technology Transfer Department Director, and TTD personnel will be assisted in developing curriculum and materials for training courses and extension activities. The TTD will also assume the role of instructor, technical advisor, and indirect supervisor for regional aquaculture agents. In-country training of the MIDA/DINAAC staff and local leaders will be provided. One DINAAC member will receive long-term training in the U.S. in fish biology.

***DESCRIPTORS***

| | | | |
|---|---|---|---|
| INSTIT BUILDING | FISHERY | FISH EXTENSION | FISHERY SURVEY |
| NUTR ANALYSIS | NUTR COST STUDY | CURRIC DEVEL | NUTR SURVEY |
| FISH HATCHERY | FISH POND CONST | FEASIBIL STUDY | DEMO FARM |
| RURAL HEALTH | CMNTY PARTIC | TECH TRANSFER | INDIGENOUS TRNG |
| PARTIC TRAINING | AGR RESEARCH | | |

SUB-PROJECT NUMBER: 00 BATCH NUMBER: 98

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UNCLASSIFIED

525021600 1201

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C. 20523

PANAMA

# PROJECT PAPER

MANAGED FISH PRODUCTION

LAC/DR-80-16

Project Number:525-0216

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

# PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: _____

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: PANAMA

3. PROJECT NUMBER: 525-0216

4. BUREAU/OFFICE: LA — 05

5. PROJECT TITLE (maximum 40 characters): Managed Fish Production

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 07 DD 31 YY 83

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY 80 B. Quarter 4 C. Final FY 82

8. COSTS ($000 OR EQUIVALENT $1 = )

| A. FUNDING SOURCE | FIRST FY ____ B. FX | C. L/C | D. Total | LIFE OF PROJECT E. FX | F. L/C | G. Total |
|---|---|---|---|---|---|---|
| AID Appropriated Total | 50 | 50 | 100 | 550 | 442 | 992 |
| (Grant) | ( 50 ) | ( 50 ) | ( 100 ) | ( 550 ) | ( 442 ) | ( 992 ) |
| (Loan) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Other U.S. 1. | | | | | | |
| Other U.S. 2. | | | | | | |
| Host Country | | 100 | 100 | 4 | 661 | 665 |
| Other Donor(s) | | | | | | |
| TOTALS | | | | | | |

9. SCHEDULE OF AID FUNDING ($000)

| A. APPROPRIATION | B. PRIMARY PURPOSE CODE | C. PRIMARY TECH. CODE 1. Grant | 2. Loan | D. OBLIGATIONS TO DATE 1. Grant | 2. Loan | E. AMOUNT APPROVED THIS ACTION 1. Grant | 2. Loan | F. LIFE OF PROJECT 1. Grant | 2. Loan |
|---|---|---|---|---|---|---|---|---|---|
| (1) FN | 322 | 314 | | | | 100 | | | |
| (2) | | | | | | | | | |
| (3) | | | | | | | | | |
| (4) | | | | | | | | | |
| TOTALS | | | | | | | | | |

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 077 968

11. SECONDARY PURPOSE CODE:

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

| A. Code | BR | R/AG | TECH | EQTY | NUTR | TNG | PART |
|---|---|---|---|---|---|---|---|
| B. Amount | | | | | | | |

13. PROJECT PURPOSE (maximum 480 characters)

To verify the need for and feasibility of implementing a large scale managed fish program.

14. SCHEDULED EVALUATIONS
Interim MM 91 YY 81 MM 92 YY 82 Final MM 93 YY 83

15. SOURCE/ORIGIN OF GOODS AND SERVICES
☒ 000 ☐ 941 ☒ Local ☐ Other (Specify) _____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment.)

17. APPROVED BY
Signature: [signature]
Title: Director, USAID/Panama
Date Signed: MM 09 DD 10 YY 80

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

AID 1330-4 (8-79)

# PROJECT AUTHORIZATION

Name of Country: PANAMA

Name of Project: Managed Fish Production
Project Number: 525-0216

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Managed Fish Production project for Panama involving planned obligations of not to exceed $992,000 in grant funds over a 3 year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project consists of assisting Panama's Ministry of Agricultural Development to expand freshwater fish production in Panama in developing its institutional capabilities, by conducting a pilot program in several rural communities, and by conducting studies to demonstrate the need for and feasibility of a large-scale managed fish production program.

3. The Project Agreement which may be negotiated and executed by the officers to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

4.a. Source and Origin of Goods and Services

Goods and services except for ocean shipping, financed by A.I.D. under the Project, shall have their source and origin in Panama or in the United States, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall except as A.I.D. may otherwise agree in writing be financed only on flag vessels of the United States.

b. Conditions Precedent to Disbursements

Prior to the disbursement under the Grant, or to the issuance by A.I.D. of documentation by which disbursement will be made for any purpose other than to finance (i) technical assistance, (ii) long-term training in the United States or (iii) construction of

hatchery ponds (iv) or vehicles, Panama will, except as A.I.D. may otherwise agree to writing, furnish in form and substance satisfactory to A.I.D. evidence that arrangements have been made for the provision of long-term technical assistance.

c. Covenant

Panama covenants that, within the first eighteen months from the date of signing of the Project Agreement, two professional staff members, one of whom shall be designated as department chief, shall be assigned to the Technology Transfer Department of the National Directorate of Aquaculture and at least four staff members located in regional directorates shall be assigned on a full time basis to aquaculture activities related to implementation of this project. These staff members shall be in addition to those staff members already employed by the National Directorate of Aquaculture and the regional directorates.

Aldelmo Ruiz
Director
USAID/Panama
September 11, 1980

MANAGED FISH PRODUCTION

PROJECT PAPER

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## I. Project Background

### A. Introduction

Many of the poorer rural areas of Panama suffer from chronic nutritional problems. Deficiencies in essential amino acids, normally contributed by animal protein, are common. A nutritional study conducted in 1967 indicated that one-sixth of the rural population is not meeting its basic daily food requirements.[1/]

According to this study only one-third of the families surveyed were considered to be consuming at least most of their overall recommended caloric-protein requirement. Almost 15% of those surveyed were consuming less than 70% of the required level and 3% of this group were getting less than 50% of requirements. Although studies in the urban areas (represented by Panama City) were not as complete as those in the countryside, findings suggested that protein-caloric malnutrition (PCM) in the cities was not nearly so severe. The study concluded that 60% of all Panamanian children under five years of age in rural and urban areas were suffering from varying degrees of malnutrition. In fact, growth retardation for the average Panamanian child was significant when compared with the generally accepted norm.[2/]

More recent data from a 1975 nutrition survey of poverty areas in Veraguas and Chiriqui provinces suggest that the nutrition situation in rural areas has deteriorated slightly since 1967, especially young children below 5 years of age.[3/] In 1967 approximately 61% of young children showed signs of protein-caloric malnutrition (PCM), while in 1975 the figure was 66%. Moreover, in Veraguas communities that have participated in Complementary Feeding Programs run by the Ministry of Health, 71 to 75 percent of young children showed signs of PCM. A recent dietary survey estimated that among rural families in Veraguas province, average consumption of protein is around 43 grams per consumption unit per day, which is approximately 30% below recommended levels.[4/]

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1/ "Evaluación Nutricional de la Población de Centro América y Panamá", Instituto de Nutrición de Centro América y Panamá (INCAP) y Oficina de Investigaciones Internacionales de los Institutos Nacionales de Salud (EEUN), 1969.

2/ For more information on the nutritional conditions in Panama, refer to "A Multi-Sectoral Analysis of the Nutritional Problem in Panama", Poynor Intl. Incorporated, June 22, 1979. This report is now on file in LAC/DR.

3/ Importancia de la Planificación de Políticas y Programas de Alimentación y Nutrición en Panamá" Dr. Cutberto Parillon D., 1980.

4/ "A Methodology for Evaluating the Nutritional Impact of the USAID Panama Managed Fishpond Project", Judith McGuire, Dec. 1979.

Food purchases of lower income rural and urban families center around what is available or affordable rather than what may be nutritious. Many of the products within relatively easy financial reach tend to be those of limited nutritional value such as rice, plantain, sugar and several types of roots. Beans are about the only relatively high-protein food consumed with regularity, although unfortunately, production and hence availability had declined markedly in many rural areas of Panama during recent years. Beef, chicken, fish and dairy products while certainly desirable are generally too expensive in most areas to be purchased with any frequency by poor people and very often are not available at all.

Inefficient food production and marketing systems are contributors to the high cost and limited availability of many nutritious foods. Seafood, for example, while obviously abundant on the coasts, does not get into the interior on a regular basis because of the lack of an effective marketing system. Vegetable products fall into the same pattern of overabundancy in some areas at some times and general scarcity at other times. Beef and poultry prices are high partly because of the high cost of feed grains -- which are costly because of low agricultural productivity. In contrast, freshwater fish culture, which tends to employ unproductive resources, not only has the potential of becoming widely diffused -- and hence readily available in rural areas -- but has the additional advantage of providing a store of food that is almost continuously available throughout the year.

B. GOP Rationale for a Large Scale Managed Fish Production Program

1. The Government of Panama (GOP) initiated a policy in the early 1970's of encouraging the production and consumption of pork, chicken and freshwater fish -- with an emphasis on fish -- as substitutes for the more expensive, scarcer beef.

The rationale of the GOP for supporting freshwater fish culture goes beyond the apparent cost advantage exhibited by comparison of alternative sources of protein (Section IV A). Given the resource base commonly found in poor rural communities - characterized by low-quality and limited area of land - it is necessary to seek alternative means of producing food aside from cropping and cattle raising. While the application of new technology to rudimentary agricultural practices could provide a large pay-off, the adaption and dissemination is extremely complex and time-consuming. In contrast, judging by its rapid rate of acceptance and diffusion, fish culture apparently offers a technology which is relatively easily adapted to the circumstance and assets found in many of Panama's rural communities. The basic ingredients or preconditions are a plot of unproductive land within a reasonable distance of a low-volume source of water, a willingness to invest

considerable labor (or capital) in the excavation of a pond, motivation to increase food intake and assistance from aquaculture specialists.

To promote freshwater fish culture the GOP established the National Directorate for Aquaculture (DINAAC) within the Ministry of Agricultural Development (MIDA) in 1976. In the early 1970's AID had financed the construction of a national fish hatchery and research station and the training of biologists, one of whom received his PhD in Aquaculture in the United States and became the director of DINAAC in 1976.

C. Current Freshwater Fish Culture Activities

Through active promotion of the Directorate of Aquaculture, 198 fishponds had been built in Panama by the end of 1979 of which 162 were active. Of these ponds all but 4 served five or more households.

The vast majority of fish ponds in Panama are small (200-800 $m^2$), usually hand-dug ponds which provide about 0.7 lbs. of fish per $m^2$ per year. There are about 125 small fish ponds currently in operation, all of which have received fingerlings from DINAAC. These ponds generally use commercial fishfeed or chicken feed to grow the fish. A smaller number of large (1000-5000 $m^2$), machine-dug ponds have also been built. To date about 75 of these ponds have been built, many through the Mission's SDA activity. The yield per $m^2$ of surface water is about the same as for small ponds. These ponds in some cases have been combined with swine production activities and/or community gardens. These integrated animal husbandry/fish/garden projects may potentially result in increased fish production at lower unit cost. At twelve ponds, hog enterprises have been established adjacent to the ponds to provide fertilizer for the pond as well as additional income and/or protein for the community. Research and actual experience in four locations have shown that small gardens can be successfully established in the vicinity of the pond to take advantage of the runoff of fertile pond water for the production of vegetables. However, such projects are technologically more complex. Clearly DINAAC has been successful in promoting the construction and starting of fishponds. The consumption impact to date is less clear, however. An average of 1.4 ponds of fish per capita per week is necessary to bring average protein consumption to the recommended level of 60 gm/day. Most small ponds produce only 140 - 700 - pounds per year while production in large ponds ranges from - 1200 - 4000 pounds per year, although there are a few exceptions (high and low) for both small and large ponds. At present, the annual yield per $m^2$ for both small and large ponds is well below the theoretical production capacity of the ponds.

The Directorate of Aquaculture is currently in charge of the operation of two aquaculture hatcheries and laboratories, training of personnel and supervision of outreach activities undertaken through regional extension offices of the Ministry of Agricultural Development. Currently the regional offices are providing sporadic technical assistance to approximately 75 communities that have large fish ponds and 125 communities with small ponds.

The primary fish species which is utilized by DINAAC to stock fishponds is a tilapia hybrid, however, five other species including, a tilapia nilotica, common carp, silver carp and guapote are being stocked. Approximately 140,000 fingerlings are produced per year. This quantity is insufficient to meet current demand for fingerlings.

## II. Priority and Relevance of the Managed Fish Production Project

The major thrust of the Mission's current development strategy for Panama is employment creation. The bulk of AID's resources in future years will be allocated to project which achieve this objective. Nevertheless, the Mission strategy explicitly recognizes that the worsening malnutrition in Panama, which is directly correlated with low productivity, must be addressed with a series of interventions aimed at alleviating the immediate manifestions of malnutrition. Although specific long-range program activities have yet to be precisely identified, support of a large-scale managed fish production program is, potentially, an excellent alternative for addressing protein deficiencies in rural Panama. The major advantage of such a program is its self-perpetuating character, especially when compared to PL 480 Title II program activities which generally have only a transitory benefit. The Managed Fish Production Project which is intended to verify the feasibility of implementing a large scale program, constitutes an important element in the effort to address the malnutrition problem in rural Panama.

## III. Description of the Project

### A. Statement of the Problem

Despite the clear evidence of the inherent attractiveness of a large-scale program of community managed fishponds as a means of addressing the problem of protein deficiencies in poor rural areas, there exist a number of unanswered substantive questions regarding the viability of a large scale managed fish production program which are not amenable to resolution in the normal project design process.

The consumption impact which increased fish production in poor rural communities might be expected have, in terms of the aggregate increase in protein intake and the distribution of that increase among families in the communities and within the family units, must be ascertained. The economic and financial implications of proposed integrated animal husbandry continuous harvest fishpond activities for the members of the poor rural communities in which they are located must be carefully assessed prior to initiating a large scale managed fish production program. Important questions relating social and administrative feasibility of a managed fish production program must be answered. These include: (1) ascertaining the degree to which participating communities will have to rely on the Ministry of Agricultural Development and other government agencies for assistance with regard to technical and organizational aspects of pond operation and for credit required to carry out integrated animal husbandry/fishpond activities, and (2) testing the feasibility of proposed alternatives for the provision of such services.

These unresolved feasibility issues can be most adequately answered by implementing a pilot project in which carefully monitored field activities are carried out and alternative arrangements are tested under semi-controlled conditions in order to generate the information required to provide answers to these major feasibility questions in which a high degree of confidence can be placed.

## B. Detailed Project Description

### 1. Goal and Purpose Statement

The sector goal is to improve the nutritional status of the rural poor. The specific program goal which will help to attain the sector goal is to expand the number and increase the productivity of fresh water fishponds in poor rural communities of Panama to directly provide an additional source of high-quality protein to community members.

The project purpose is to verify the need for and feasibility of implementing a large scale managed fish oriented toward increasing the nutritional status of poor rural families through the direct consumption of fish.

During the past four years Panama's Ministry of Agricultural Development (MIDA) has been engaged in an ambitious effort to promote fresh water fish culture in many poor rural communities in the central provinces of Panama. To date MIDA's National Aquaculture Directorate has adopted existing technologies from Asia and North America to Panamanian conditions and is employing various species tilapia and carp in the community fishponds. This effort has achieved notable success in terms of the number of fishponds built, over 200, and in terms of the acceptance

of fish as a highly desired food among rural Panamanian households. Nevertheless, production (and consumption) of fish in most communities is presently quite limited. An expanded managed fish production program would be directed to increasing production in each community to a level where it would have a meaningful consumption impact as well as expanding the number of communities served by pond projects. This is to be done through the introduction of new technologies and management techniques which should increase pond yields, i.e. through the introduction of integrated swine/fish/garden projects with continuous (bi-weekly) fish harvesting.

Although a large-scale managed fish production program using the integrated animal/fish/garden concept is likely to be successful there are a number of important issues of consumption impact and of technical, economic, social and administrative feasibility which cannot be satisfactorily answered (see Section III.B.2.b. - Project Outputs - Project Studies) without further field investigations. In particular, there are a number of unknowns with regard to the best means to implement a managed fish production program. These studies require that a significant amount of data be gathered under carefully monitored, quasi-experimental conditions. The most effective way of carrying out these studies is to implement a pilot project in which major impact and feasibility issues are answered through the development and implementation of carefully monitored fish pond projects and in which the institutional arrangements required for a large scale managed fish production program (about which significant uncertainty exists) are implemented on a trial basis.

2. Project Outputs and Inputs

This pilot project will test the technical, administrative and economic/financial feasibility of a program of integrated animal/fish garden projects. It will measure the consumption (nutritional) impact of such projects. It will also strengthen the MIDA/DINAAC's institutional structure where necessary in order to provide an adequate basis on which to evaluate issues of program feasibility.

Specific outputs of the project include (1) demonstration pond projects; (2) project studies; (3) an operational technology transfer program which utilizes trained professional and para-professional personnel; and (4) an expanded and improved hatchery operation. Each of these project outputs is necessary to achieve the project purpose.

a. Demonstration Pond Projects

(1) Scope of Activity

The primary objective of these demonstration pond projects is to generate the data required to carry out the feasibility studies described in Output b.

Approximately 20 demonstration pond projects will be developed under semi-controlled conditions. These projects will be operated with different technologies and institutional/management mixes in order to facilitate comparisons of the feasibility of alternative technologies and institutional approaches. Examples of the technological and institutional changes to be tested include community fingerling production, community selection (sexing) of fish, continuous harvest fishponds with integrated fish and animal production, different sizes of continuous harvest ponds, the use of local para-professional personnel, and the use of agricultural production cooperatives to channel credit for pond projects. The innovations which are introduced will attempt to gradually transfer responsibility for major aspects of integrated fishpond management to the fishpond communities or to organizations which have a direct and on-going association with community groups. According to the technological and institutional factors tested at at each pond-site, projects may require the establishment of a completely new fishpond activity or they may involve modification or expansion of existing ponds. These innovations will be, in most cases, introduced on an incremental basis up-grading existing ponds, e.g., converting successful single harvest ponds to continuous harvest or adding animal husbandry projects to fish only ponds.

(2) Pond Site Selection

Demonstration pond projects will be located within a project area consisting of Veraguas, eastern Chiriquí, Coclé, and Herrera provinces. Sites for the demonstration projects will be based on the requirements of the project studies and on the types of technological and institutional innovations which will be introduced. Prior community interest and evidence of community initiative as well as factors such as the likelihood of nutritional deficiencies, accessibility, and technical considerations will be considered as community selection criteria.

Because fishpond projects initiated in this project will be used to determine impact on communities and feasibility of various culture systems and for demonstration purposes to motivate communities to start or expand fish culture projects in areas where there is a high nutritional need, there is a need to carefully select communities in which the project ponds are located. Preliminary selection of demonstration pond sites will be done by means of a survey of possible pond sites, which will be evaluated by a representative of nutrition department of the MOH, representatives of DINAAC and the regional MIDA offices, the social scientist in charge of the project studies and a USAID representative.

Selection criteria to be applied include:

(a) Probable nutritional need

Within the project area (eastern Chiriquí, Coclé, Herrera, and Veraguas Provinces) communities will be chosen in areas which are identified by the Ministry of Health as having a high incidence of malnutrition. In addition, nutritional need will be corroborated by the on-site surveys of the particular communities tentatively selected as sites for demonstration pond projects. This will be done by means of a visual inspection of living standards and personal contact with residents to assess the general pattern of food consumption and relative economic status.

(b) Community Interest in and Commitment to Fresh Water Fish Ponds

Communities demonstrating an interest in fish culture as evidenced by successful prior experience with fishponds will be given preference, while communities manifesting a high degree of interest or having an outstanding request for the services of DINAAC will also be considered. In addition, members of the prospective fish culture groups must demonstrate an ability to organize themselves by either having worked on a community development project, or by having obtained membership in an established cooperative for the purpose of jointly conducting a productive activity.

(c) Adequate Pond Sites

Potential participating communities must be evaluated for adequacy of pond sites. The prospective fish culture group must be able to provide free of outside claim, a plot of land which can be served by a year-round supply of fresh water fed by gravity flow; which has impermeable soils; and which will allow the construction of one or more ponds of at least 1,000 $m^2$ in surface area at a reasonable cost.

(d) Potential Demonstration Effect

To the extent feasible, selected communities will be strategically or centrally located to serve as demonstration models for surrounding communities.

(e) Access

The prospective community and pond site must be accessible to an existing road which can be transited by vehicles throughout the year. Final selection of demonstration pond project sites will be made by Directorate of Aquaculture based on the recommendations of the survey team. The sites selected will be subject to approval by USAID/Panama.

(3) Inputs Required for the Demonstration Pond Projects

$90,000 of grant funds and $20,000 of counterpart funds will be provided for the construction of ponds and animal enclosures. Approximately six hectares of ponds will be constructed. AID and GOP funds will finance earth movement, materials to build pond drains, water inlets and small cofferdams to divert water into ponds and construction materials for the animal enclosures. The communities which participate in the demonstration project will contribute unskilled labor and local materials during the construction of the ponds. They will also contribute their labor during the operational phase of the projects. The estimated value of the community contribution over the life of the project is $25,000.

A small revolving credit fund will be established to finance costs associated with the operation of the demonstration pond projects. The AID grant will provide $10,000 to this fund while GOP counterpart will provide an additional $20,000.

In order to effectively develop and implement the demonstration pond projects, MIDA will expand the number of extension agents operating out MIDA's regional offices who deal with aquaculture on a full-time basis. It is expected that eight additional agents will be added to the staff within the first eighteen months to two years of the project. These agents are expected to be selected from a number of students now pursuing a three year course of study in aquaculture at the Regional University Center in Santiago.

Approximately $50,000 in AID funds will finance the acquisition of four diesel pick-up trucks to be used by the extension agents to carry out their duties.

b. Project Studies

A series of three interrelated feasibility studies constitute a major project output. These studies are closely related to and dependent on the implementation of the demonstration pond project activity which will provide the primary data base for the feasibility studies.

The three feasibility studies which will be conducted as part of the project are: (1) program effectiveness study; (2) consumption impact study; and (3) economic/financial feasibility. Preliminary scopes of work for these studies are contained in Annexes V and X. The major objectives and the general approach of these studies are discussed below.

## (1) Objectives of Project Studies

### (a) Program Effectiveness Study

This study is intended to evaluate the social and administrative feasibility of the proposed program. Because there is significant uncertainty about the social and/or administrative feasibility of the technologies and the institutional arrangements proposed for the project, these will be implemented on a limited scale and will be carefully monitored on an on-going basis by an experienced anthropologist. Particular attention will be paid to the effectiveness of major elements of the service delivery outreach system, e.g. dissemination of fish culture technologies, technical assistance to communities, credit, provision of inputs for integrated animal husbandry/fish projects, within the socio-cultural context of each village. The social soundness analysis has shown that the community groups which implement fishpond projects almost inevitably are highly dependent on MIDA/DINAAC services, at least during the initial implementation of the pond projects, while current MIDA/DINAAC outreach activities are constrained by work overloads and vehicle shortages. As a result a flexible program implementation strategy will be adopted by MIDA which will emphasize three interrelated factors: (1) development of a community selection process which will maximize the likelihood that the communities selected can effectively implement fishpond projects; (2) reliance on other existing financial and organizational resources which can assist community groups to develop fishponds activities; and (3) experimentation with different organizational arrangements, in order to identify cost-effective ways to implement a large scale managed fish production program.

### (b) Consumption Impact Study

Because the ultimate objective of a large-scale managed fish program is to raise nutritional levels in poor rural communities where fishpond activities are implemented, it is important to attempt to assess the impact that such a program may have. In order to obtain an indication of likely nutritional impact which will result from implementation of fishpond activities. on a continuous harvest basis, a consumption impact study will be undertaken. This study will attempt to measure changes in food consumption within poor rural communities which result from implementation of fishpond projects. The decision to use a consumption impact survey as a proxy for measuring estimated nutritional impact is based on a study financed by the USDA Nutrition Economics Group under RSSA 3-77 (Economic Analysis of Agricultural Policies). This proposed methodology for evaluating the impact of the managed fishpond project serves as the basis for the scope of work for the consumption impact study

(see Annex X). This study indicates that other tests e.g. anthropomorphic tests, measurements of infant mortality and blood chemistry tests, are unlikely to yield meaningful data. A consumption impact survey is proposed as a feasible alternative for measuring likely nutritional impact.

The consumption impact study will gather baseline data on food consumption in all communities selected for demonstration pond projects by means of a 24 hour dietary recall survey administered at least once before fish harvesting on a continuous basis begins and periodically thereafter during the life of the project. These data, when analyzed using appropriate statistical techniques, will permit an evaluation of the nutritional impact which can be expected to be obtained through the implementation of a large-scale managed fish production program in poor rural communities in Panama.

(c) Economic/Financial Analysis

The economic/financial analysis will focus on the managed fish production activity from the standpoint of the participating families. It will assess the financial feasibility of poor rural families' participation in managed fish production activities and the amount of subsidy which may be necessary to make managed fish production a viable option for the poorest communities. A scope of work for this study is included as Annex 5.B.

(2) Implementation of Project Studies

The three project studies (consumption impact, economic/financial and program effectiveness) will be closely coordinated to achieve an efficient utilization of human and material resources. Simultaneous research for these studies will be carried out on three levels: the household level, the integrated fish pond project level, and the community level. The methodology for implementing the project studies will consist of carrying out baseline research at household, fishpond project and community levels in each community selected to participate in the demonstration pond activity and will include periodic follow-up studies in each village. The baseline activity will precede any interventions in selected demonstration fishpond projects. Return visits will be scheduled periodical-y after demonstration pond projects are implemented.

The principal research questions addressed at each level include:

(a) Household level - Do fishponds and related animal production, horticulture or forage production improve household nutritional levels as measured by total household protein consumption and increased dietary variety? To what degree? At what cost? Which households benefit and why? Are households having the poorest diet reached?

(b) Community level - Which communities benefit and why? Are communities having the poorest diets reached? What community characteristics correlate with or affect positive or negative outcomes? Can pond projects be extended to other communities and to what type? Which components in which combinations can be extended?

(c) Fishpond project level - What is total pond output of different technological options? Is output relative to village size adequate to affect meaningful household dietary change? Is output distributed among or sold to participants adequate to affect a change? How much production is sold to non-participants? What are construction and operating costs of fishponds? MIDA/DINAAC overhead costs? What is relative effectiveness of linkages between MIDA/DINAAC and community groups?

A preliminary scope of work is presented in Annex 5.A.

(3) Required Inputs for Project Studies

A social scientist (budgeted under external technical assistance) will coordinate the studies and have primary responsibility for carrying out the program effectiveness study. The consumption impact and economic/financial studies will be directly supervised by a contract panamanian nutritionist and economist respectively. A team consisting of a field supervisor and four interviewers will spend the major part of its time gathering household food consumption data but will gather data on village characteristics. They will also work with the extension agents to gather production and cost data for the demonstration fishpond projects. A data analyst will be contracted on a part-time basis to perform statistical analysis of data. Grant funds will also be provided for equipment and materials needed for the studies, for computer analysis, for field team per diem and for the purchase of a blazer type vehicle for the field team. The cost of these inputs, excluding costs related to the contracting of the social scientist are estimated to be $175,000.

c. Technology Transfer Program Development

The staff and functions of the Technology Transfer department of DINAAC will be expanded in order to improve the overall technical capabilities of the aquaculture program. Currently

the department has one technician with ample field experience but limited formal training in aquaculture. At present, the department has a limited capability to provide specific technical guidance to aquaculture agents in the field and to prepare educational materials for its clientele.

The current functions of this office must be expanded to include preparation of training materials and technical bulletins for aquaculture extension agents, recollection and dissemination of lessons learned from particular pond projects, systematic and periodic training of agents to expand their knowledge of aquaculture, training of new aquaculture recruits, and training of fish farmers who have the interest and aptitude to function as para-professional aquaculturist in the communities. Moreover, the department will be required to assume greater responsibilities for monitoring and evaluating the work of aquaculture extension agents. In effect the Technology Transfer Department will function as instructor, technical advisor and indirect supervisor of the regional aquaculture agents. It will review the performance of regional departments of aquaculture, which are directly supervised by regional directors of MIDA, to assure that minimum standards of technical performance are maintained.

To implement the technology transfer activity, two additional staff positions in DINAAC will be created, including that of a Technology Transfer Department Director. This activity will receive approximately 15 person-months of external technical assistance from an aquaculture expert who will work with members of the technology transfer unit to develop curriculum and materials for training courses and extension activities. The social scientist in charge of the program effectiveness study will also provide advice and assistance to this unit.

Grant funds amounting to $48,000 will finance curriculum materials development and dissemination (including radio broadcasts) and a utility vehicle while the GOP will finance additional staff positions. Technical assistance costs are budgeted under that activity.

d. Training

Training activities will be primarily oriented toward in-country training of MIDA/DINAAC staff, para-professionals and community leaders. However, long-term external training in the U.S. will be provided for one DINAAC staff member in fish biology to fill a currently existing critical need for additional technical backstopping of the extension agents located in regional offices. Fourty-three thousand in grant funds will be

used to finance the long-term training in the U.S. while ten thousand will be applied to cover expenditures related to in country training. The GOP will finance travel expenditures for the long-term training (2,000 dollars) and some of the costs of in-country training (8,000 dollars).

e. Technical Assistance

Approximately fifty person-months of external technical assistance will be provided with grant funds. This technical assistance will consist of 16/17 months of services of a social scientist, 30 months of services of one or two aquaculture experts, and three months of specialized short-term services. The social scientist will be responsible for carrying out the program effectiveness study and will coordinate the other project studies. He or she may be contracted on a part-time basis for the life of the project. The aquaculture technical assistance will be provided by one or two specialists. The aquaculture expert(s) will assist in the implementation of the demonstration pond activity, supervise the organization of DINAAC's, technology transfer activity and provide specialized training to MIDA personnel. The short-term technical assistance will address specific problems or needs which will occur during the project e.g., for a nutritionist to prepare the final design of the consumption impact study. A four wheel drive vehicle for use by the technical experts will also be financed. Grant funds amounting to $424,000 will be allocated for the technical assistance. In the event that technical assistance requirements can be fully met without utilizing all available grant funding, the remaining funds may be used to finance additional long-term training in the U.S.

f. Hatchery Expansion

The existing hatchery is operating at full capacity and is unable to keep up with existing demand. In order to implement the demonstration pond activity without negatively affecting fingerling supply to existing ponds, it will be necessary to expand the hatchery operation during the first year of the project. This expansion will permit a greater volume and more varieties of fish to be produced. The hatchery expansion will include 50 additional ponds and related infrastructure. The ponds' surface will cover 5 hectares. The expansion will cost approximately 170,000 dollars of which 95,000 dollars will be funded by the grant and 75,000 dollars by the GOP. The grant will also finance major equipment valued at 47,000 dollars for the project such as a diesel generator and water pumps and a pick-up truck for hatchery operations, while the GOP will finance 50,000 dollars of minor equipment such as seines and transport tanks as

well as costs of additional unskilled labor required to operate an expanded hatchery operation which are estimated to be $50,000.

g. Operating Expenditures

Operational expenditures not budgeted to specific activities include operation and maintenance of project vehicles, office materials, additional salaries, increased hatchery operation costs and per diem for MIDA personnel. These costs will be assumed by the GOP. Estimated counterpart required for operating expenditures not budgeted under specific activities is projected at $200,000.

3. Summary Financial Plan

| | AID | GOP | COMMUNITIES |
|---|---|---|---|
| A. Demonstration Pond Projects | 150,000 | 190,000 | 25,000 |
| (1) Materials and Equipment for Pond and Animal Enclosure Construction | (90,000) | (20,000) | |
| (2) Credit Fund | (10,000) | (20,000) | |
| (3) Diesel Pick-ups (4) | (50,000) | | |
| (4) Additional Extension Agents (8) | | (150,000 | |
| (5) Local Labor and Materials | | | (25,000) |
| B. Project Studies | 175,000 | | |
| (1) Sub-project (CJS) 1/2 time | (15,000) | | |
| (2) Sub-project Director (ECON/ FIN) 1/2 time | (15,000) | | |
| (3) Data Analyst (1/2 time) | (15,000) | | |
| (4) Field Supervisor | (18,000) | | |
| (5) Interviewers (4) | (50,000) | | |
| (6) Per Diem Interviewers | (30,000) | | |
| (7) Computer Analysis | (10,000) | | |
| (8) Equipment and Materials | (10,000) | | |
| (9) Vehicle Purchase | (12,000) | | |
| C. Technology Transfer | 48,000 | 55,000 | |
| (1) Materials Development and Dissemination | (36,000) | | |
| (2) Blazer-type Vehicle | (12,000) | | |
| (3) Additional Staff | | (55,000) | |
| D. Training | 53,000 | 10,000 | |
| (1) Long-term US (2 person-years) | (43,000) | (2,000) | |
| (2) In-country Training | (10,000) | (8,000) | |
| E. External Technical Assistance | 424,000 | | |
| (1) Project Studies Coordination (1/2 time for 33 months) | (138,000) | | |
| (2) Aquaculture Expert(s) 30 p-m | (250,000) | | |
| (3) Short-term T.A. 3 p-m | (24,000) | | |
| (4) Utility Vehicle | (10,000) | | |
| F. Hatchery Expansion | 142,000 | 175,000 | |
| (1) Construction | (95,000) | (75,000) | |

| | AID | GOP | COMMUNITIES |
|---|---|---|---|
| (2) Equipment | (35,000) | (50,000) | |
| (3) Diesel pick-up | (12,000) | | |
| (4) Additional Labor | | (50,000) | |
| G. Operating Expenditures | | 200,000 | |
| (1) Vehicle Operation | | (130,000) | |
| (2) Office materials | | (10,000) | |
| (3) Incremental Hatchery Overhead | | (15,000) | |
| (4) Per Diem | | (20,000) | |
| (5) Chief of Planning Department | | (35,000) | |
| TOTAL PROJECT | 992,000 | 640,000 | 25,000 |

## 4. Description of Project Beneficiaries

The direct beneficiaries of this project will be an estimated 7,500 rural poor families currently affected by the aquaculture program and an additional 10,000 persons who are expected to be incorporated in the program over the three year period of the project. Of the 10,000 new persons to participate in fish culture activities, 2,000 will be directly affected by the demonstration pond activity and 8,000 persons will benefit from additional small community pond projects to be initiated with DINAAC assistance.

In keeping with the nutrition focus of this project the principal criterion for selecting beneficiaries will be their location within a geographic area which is determined primarily by nutrition indicators. Within the geographic area previously identified by the Ministry of Health as having a serious incidence of malnutrition, there are seven district which were cited in the FY 80 CDSS as "poverty areas" deserving special consideration in the assignment of AID resources. All of these districts fall within the current and projected radius of action of the GOP fresh water aquaculture program, which will encompass eastern Chiriquí Province, Veraguas, Los Santos, Herrera and Coclé provinces. (See Table III.4.A.).

The rural poor in these provinces are primarily subsistence farmers and marginal producers of a marketable agricultural surplus. There are both mestizo and Guaymi Indian families within the project area. The subsistance farmers generally practice rudimentary agriculture in the production of rice, beans, tubers and small animals and have very little surplus for sale. They are settled in a relatively stable community, but periodically, may perform daily labor on larger neighboring farms or temporarily may relocate in a sugar cane producing area to earn cash wages.

Their family income is in the neighborhood of $1,000 of which perhaps $300 is earned in cash. The small farmers, who have access to slightly more land, are living under much the same conditions as the subsistance farmer but are able to market a small surplus from this production. They have fewer work days available for performing off-farm wage work. Their family incomes would be about $1,400 of which around $400 may be earned from cash sales and wages. Both groups are among the rural poor category described in the 1980 CDSS. Their circumstances of daily life are similar in that they endure poverty of assets, education, health, nutrition, sanitary conditions, employment, and other attributes. Some families endure slightly more unfavorable conditions than others in terms of a quantitative comparison of possessions, or years of education or degree of malnutrition, etc., but in practical terms there is little value in drawing a distinction between the groups.

TABLE III 4.A.

Comparative List of Districts with a High Incidence of Malnutrition and Poverty

| Province | High Incidence of Malnutrition 1/ | Poverty Area by CDSS 2/ | Poverty Area by Radiografía 3/ |
|---|---|---|---|
| Chiriquí | Remedios<br>Renacimiento<br>San Felix<br>San Lorenzo<br>Tolé | Bugaba;<br>Gualaca<br>Renacimiento<br>Remedios<br>San Felix<br>San Lorenzo<br>Tolé | Tolé |
| Veraguas | Cañazas<br>Montijo<br>Las Palmas<br>Río de Jesús<br>San Francisco | Calobre;<br>La Mesa<br>Cañazas<br>Las Palmas<br>San Francisco<br>Santa Fé<br>Soná | |
| Coclé | -- | Antón<br>La Pintada<br>Olá | La Pintada<br>Olá |
| Herrera | -- | Las Minas<br>Los Pozos | Las Minas |

NOTE: The twelve underlined Districts are common to two methodologies defining malnutrition or poverty.

1/ Districts with a High Risk of Malnutrition, Ministry of Health, 1974 (partial list)
2/ FY 80 Country Development Strategy Statement, USAID Panama (complete list)
3/ Radiography of Poverty in Panama, Ministry of Planning, 1977 (partial list).

# IV. Project Analyses

## A. Economic Analysis

### 1. Introduction

The main economic concern of this project is to encourage the development of a system or systems that will provide extra protein to protein deficient campesinos at the lowest possible cost to the individual recipients and society and that can be effectively managed by the participants with a modest cash outlay. Hence, one of the major elements of the pilot project will be the establishment of a data collection system which will allow us to determine, with some precision, the level of financial and economic viability of the fish pond models being tested. The data should enable us to determine if (1) the cost of fish protein is sufficiently less, as our preliminary data indicate, than that of beef, chicken, or pork in order to provide the necessary incentive to undertake the risk of producing fish; (2) the cost is sufficiently low to allow the families working the ponds to purchase enough fish to meet their minimum protein needs; and (3) a subsidy is needed and/or desirable. The proposed methodology for accomplishing these tasks is fully described in Annex V.B, Part 1, Scope of Work for Economic/Financial Feasibility. A preliminary analysis of this topic has been conducted. The summary results of this preliminary analysis are presented below.

### 2. Freshwater pond-farmed fish as an inexpensive protein source

From the point of view of society the relative cost of producing and delivering animal protein to Panama's rural poor is the relevant comparison. The costs of freshwater fish production and its alternatives -- purchases of beef, pork, poultry or salt water fish - can be compared to derive the least cost alternatives. For our purposes, the market prices of these products are the best available proxy indicators for judging the relative costs of the alternatives and hence appropriateness of promoting fish culture. While there are disadvantages to this approach, e.g., products are often not available because of poor transport or seasonality and market imperfections often create price distortions, the price of substitute goods, nevertheless, represents the most feasible approximation of the opportunity cost of fish produced at the site of consumption. It should be noted that the prices of pork and beef used in this section are average figures based on prices at small urban markets in rural areas. They do not reflect the added cost of transport to the more remote village sites, nor do they reflect the probable superior quality of fresh fish compared to meats transported from outside the consuming area.

An examination of the relative prices of alternative sources of protein demonstrates that the production of fish constitutes a reasonable and justifiable alternative to other products. Implicitly it is argued that prices of fish substitutes -- beef, pork, chicken and saltwater fish -- reflect their value to society (desirability) and also their cost of production.[1/]

The average cost per pound and per gram of protein for various meats and fish are shown below in Table IV.A.1. A review of the data reveals that a gram of fish protein is approximately 60% less costly than beef, and 33% less than chicken.

The "consumer price", i.e. the average price charged to those not participating in the community fish pond activity, of fresh water fish produced in small ponds has been established at $.40 per pound for the project analysis. While this price is believed to be low in relation to what consumers might be willing to pay, there is insufficient evidence to establish an accurate price. However, the current prices charged at the community fish ponds are 15-20 cents per pound of whole fish for participants and 30-50 cents for non-participants.

TABLE IV A.1

PROTEIN COST BY PRODUCT SOURCE

| Product | Price/lb.[1/] (453.6 grams) | Grams Protein[2/] per gram product | Cost per gram of protein |
|---|---|---|---|
| Beef | $ 1.40 | .21 | $ .015 |
| Pork | 1.55 | .13 | .026 |
| Chicken | .75 | .18 | .009 |
| Freshwater | .40 | .20 | .006 |

1/ Average market prices as of June 1980
2/ INCAP, Tabla de Composición de Alimentos, 1961

1/ Although it is recognized that food products sometimes are priced at a premium over their actual cost and that established controls distort prices, there is no feasible method to correct for these factors and they must be ignored. Similarly, the pricing mechanisms do not take into account the many subsidies that government currently provides in the form of market intervention, participation in production, credit policy and research, which also tend to modify the supply of products, and the price structure. However, in order to simplify the analysis, no attempt will be made to adjust prices for these factors.

## 3. Analysis of Alternative Fishpond Systems

In this section we describe two alternative models and discuss the results we expect will be achieved by them. These models, an integrated fish/swine system and a fish only (commercial feed) system represent the two major technologies currently employed. The data used are based on the experience with the existing fish ponds, and on what we consider to be reasonable fish production and consumption level assumptions. The purpose of the analysis is to establish preliminary cost estimates and to do a preliminary comparison of alternative systems in order to demonstrate preliminary financial feasibility. Final comparisons will be made as a part of the economic/financial feasibility study carried out during project implementation.

As discussed in detail in the Financial Analysis Annex III, we anticipate developing a total of 20 ponds of three different sizes: 10 type A or 5,000 $m^2$ ponds; 5 type B or 2,500 $m^2$ ponds; and 5 type C or 1,000 $m^2$ ponds. Since the largest number to be constructed will be type A, and since the variables are proportional to the size of the pond, the 5,000 $m^2$ pond will be presented as illustrative of all three sizes to be constructed under the project.

### a) The Fish/Swine Integrated System

The demonstration test model for this integrated fish production system will be a 5,000 $m^2$ pond stocked with *tilapia nilotica* hybrids and fed by the wastes resulting from a 25 hog fattening operation. To the extent that terrain and pond water run-off permit, a vegetable garden will also be established as part of the demonstration project but is excluded from this analysis.

It is recognized that in practice there will be significant variation in the size of the pond and of the swine operation, principally because of the terrain available for the pond. However, as we note above, since even a 500% variation in pond size is not expected to cause significant variation in yield per unit area, the analysis presented here will be confined to the one model size. Also, cost of construction (by machine) per $m^2$ of surface area does not appear to vary significantly as size of pond is varied.

#### (1) Output of the Integrated Fish/Swine Production Model

Approximately three months after the fish are stocked, partial harvesting of the pond will commence on a weekly or bi-weekly basis first to serve the families directly operating the system, and secondly to provide non-participating families

with the remaining fish from the partial harvest. Partial harvesting will occur over a 9 month period. At the end of this nine month partial harvesting period (twelfth month of the total process), a total harvest will be carried out in order to drain the pond and dredge the silt that collects over the twelve month period. With the cleaning completed, the fish growing cycle begins anew.

The swine fattening operation will commence immediately after the pond is stocked and will be completed in approximately 5 months. The hogs then will be transported to a regional market for sale. A second cycle of swine fattening will be completed before a total harvest of fish is carried out after 12 full months of production (including 9 months of harvesting).

With a best estimate of 1 lb. per square meter for the fish yield, the total output of this integrated 5,000 $m^2$ fish pond/swine system after 12 months of operation would be 5,000 lbs. of fresh fish and 50 hogs averaging 150 pounds each (live weight).

(2) Financial Flows

This analysis assumes that current practice of charging 15 cents per pound of fish to the participating families and 40 cents to non-participating families, will be continued.

In addition to the price assumptions discussed above, the financial-flow estimates (and later the financial/economic analysis) for the demonstration model are based on the following assumptions:

i) total fish production and sales will be 5,000 lbs;

ii) the average family contains five people;

iii) there will be 20 families participating in the direct operation of the fish pond/swine activity;

iv) the participating families will consume 4,000 lbs. of fish over the 9 month period. This implies that consumption will be slightly greater than 1 lb. per week for each family member -- a 15-20% increase in protein consumption over estimated current levels; and

v) the 1,000 lbs. of excess fish will be sold to some 50-100 non-participating families living in the vicinity of the fish pond.

Because it is a pilot program, and because we are not certain of the supply and demand responses, the risk involved in the new enterprise will be reduced by having the GOP construct the pond and swine enclosures without charge to the participants. The operating expenses, however, will be the full responsibility of the participating families. After the pond and swine enclosure are constructed, it is expected that the participants will cover their operating expenses by obtaining a production credit loan through either MIDA or a local cooperative. A loan of approximately $3,000 will finance the swine operation, while $350 will be sufficient for stocking the pond. The first cycle of swine fattening will be completed in six months; the hogs will be sold and the production credit loan repaid with the proceeds. Then, a second production credit loan will be obtained and the swine cycle will be repeated. Beginning in the fourth month of fish pond operation, some proceeds from the fish sales may be applied toward the working capital required for the swine operation.

After the first year of operation of the integrated system,it is expected that the participants will have accumulated a cash surplus of $900 part of which will be applied toward the working capital fund for the following year. The example used in the consolidated budget (Annex V B, Part II, Table 1 shows that in years two, and three and four, respectively, $500, $1,000, and $2,000 of the previous year's cash balance is applied toward the working capital fund. By year five the entire amount of working capital required for the swine operation $3,000 will be accumulated and the production credit loan is no longer needed. The annual cash surplus increases gradually from $900 in year one to $1,200 in year five as a result of declining interest expenses. A total cash surplus of $5,190 will be accumulated by the end of year five, unless some of the cash surplus is distributed among the participants of the pond project.

(3) Financial/Economic Analysis

Since we have assumed it is not necessary to make any adjustments to the prices, the financial and economic analysis are equivalent.

To estimate the economic feasibility of the enterprise we need to complete the demonstration model by adding estimates (or assumptions) for the operating costs of each activity to the assumptions presented earlier. By using current operating cost estimates, as shown in detail in Annex V B, Part II, Table 2, ignoring the fixed costs of constructing the pond and enclosure, and including all the other assumptions discussed earlier, a positive net balance each year is generated for the swine and fish pond activities -- implying an infinitely large IRR value.

However, if the capital costs for constructing the ponds and enclosure are included, there would be a negative IRR, i.e., there would be considerable absolute income loss over the 10 year period analyzed (see Annex V B, Part I, Table 3). The model obviously contains a number of critical variables such as the fish yield/$m^2$ of a pond and the cost of fingerlings. Any small variation in them might lead to an enterprise that can support the capital costs. For example, one way to overcome the deficit and obtain an IRR of 10% is to raise the price of fish by $0.16/lb. so that the participants would pay $0.31/lb. and the non-participants $0.56/lb.

b) Fish - only Model

An alternative system for providing fish without using wastes from a swine operation will also be examined. In this alternative system a commercially produced fish concentrate ration replaces the swine wastes as the fish food. Hence, what is costless fish food (swine wastes) under the integrated system now has a cost attached to it. The increased cost is partially offset, however, by the much higher yield obtained from the fish concentrate (maintaining a pond in production under this system requires about as much fish food as the integrated system.

At the $0.15 and $0.40 sale prices to participants and non-participating families, our set of assumptions for the fish only model lead to an annual operating deficit of $.80. By increasing the sale price to the non participants by a mere $.01, however, the operating costs can be covered by the revenues. To cover the pond construction costs as well as the operating costs and produce an IRR of 10%, the prices would have to be raised by $.13/lb to $.53 and $.28 for the non-participating and participating families.

During the project's life, the fish only model will be used for those communities that have not had previous experience with the fish culture. By eliminating the swine operation, the system becomes simplified and hence more manageable - a clear advantage over the integrated system. This advantage may be negated, however, by increases in fish concentrate prices which have been occurring recently.

A major purpose of the various studies conducted under this project will be to determine what price(s) the families can afford and are willing to pay for the fish, and how much they will consume. With this demand data and the cost figures, we will be able to determine whether or not the fish ponds can be self-financing. For example, if it is found that the swine operation is often unmanageable (or difficult to manage) and that the market will bear a price sufficiently high to accommodate the use of the fish concentrate, a potential recommendation might

be to eliminate the swine component and instead use the fish concentrate. Yet, the very dependence upon an outside source to supply such an important, price volatile, element as the fish food may well militate against its use, unless it could be vertically integrated into the process. Experience with the various models will allow us to determine the most efficient system given the costs, revenues, risks, and capabilities of the participants. Once reliable data from actual field experiences are available, we will be able to determine the impact of the variables and whether or not a subsidy is necessary. This information is useful to determine under what conditions or large scale managed fish program may be economically feasible.

B. Social Soundness

A detailed social soundness analysis (see Annex IX) was carried out. This analysis focussed particularly on the nature and organization of community groups involved in the managed fish production activity. The basis of the analysis was a sample of 12 community pond projects from existing universe of approximately 200 ponds. The major findings of the social analysis as well as more detailed discussion of the nature and organization of community groups and an assessment of the potential for replication of pond projects are presented below.

1. Major Findings and Recommendations of the Social Soundness Analysis

a. The "issue" of acceptance of fish as part of the campesino's diet is a non-issue. Fish (tilapia) are readily incorporated into the family diet, including that of small children (under five years of age).

b. The organization basis of community interest groups which are operating fishponds is diverse.

c. Successful projects are positively correlated with prior interest within the community, but not with a specific organizational type.

d. Existing community interest groups are highly dependent on GOP agencies for supervision and inputs for fishpond operation. This dependence cannot be completely eliminated, especially in the initial phases of a fishpond operation, but measures can be tried which may somewhat reduce such dependency.

e. Participation rates are variable but are positively correlated with the degree of community interest in fishponds prior to initiation of the activity. Participation is motivated by the desire to have an additional source of food, especially one which is highly esteemed such as fish. In a number of communities, especially in latino areas, women have been instrumental in implementing fish projects.

f. The aquaculture program should focus on consolidation of efforts in the current program area (Veraguas province) and then expand into adjacent areas (Coclé Province and eastern Chiriquí province). Within these geographic limits new ponds should be limited to communities which have made spontaneous requests for ponds.

g. DINAAC should not impose complex integrated projects but rather should experiment with incremental models which gradually add more complex technologies, e.g. animal husbandry and horticulture, to fishpond operations.

h. Outreach by MIDA/DINAAC is constrained by work overloads and vehicle shortages. Other sources of outreach should be utilized where possible. Basic training in aquaculture, pig-raising and horticulture and in simple financial management, credit and cooperative management should be gradually provided to community leaders and local paraprofessionals as these communities move from simple fishpond operation to more complex activities.

i. DINAAC must gather systematic data on fishpond project histories and impacts.

2. The Nature of Existing Fishpond Committees

a. Number, Origin, and Responsibilities of Fishpond Committees

By the end of 1979, 198 fishponds had been built in Panama of which 162 are currently active. Of these ponds all but 24 serve five or more households. While some ponds are organized as part of a formal organizational structure such as asentamientos campesinos (5 ponds) or on the basis of extended family relationships, the vast majority of ponds function on the basis of fishpond committees. These fishpond committees are cooperative organizations of community members established to build and maintain fishponds which operate on an informal basis much like health committees and parent-teacher groups.

The organizational basis and experience of the community interest groups which are implementing existing fishpond is diverse. No specific type of pre-existing community group serves

as a consistent nucleus for the establishment of fishpond sites. A survey of twelve communities with fishponds was carried out as part of the project's social soundness analysis showed that all of the communities surveyed had some sort of pre-existing organization such as health committees (comités de salud), parent-teacher groups (padres de familia), community groups (grupos comunales), CARITAS agricultural groups (grupos arados) and locally selected quasi-political governing bodies (juntas locales). Fishpond committees generally have either the same membership as these organizations or draw part of their membership from them; although in some cases individuals within communities may promote fishpond activities. These organizations are common in most rural areas of Panama and the majority of rural communities have at least one of these organizations.

The type of the community organization is not identified by the social soundness analysis as a factor which has a critical impact on the success of existing fishponds. Successful projects (defined as those projects which continue to operate with high community participation rates, which have amplified their scope of activities, e.g. pond expansion, addition of a complementary activity such as pigs and/or gardens, and where ponds have been replicated) are more closely correlated to a high degree prior interest within the community than to a specific organizational form. This prior community interest, is generated by factors such as radio promotion or seeing a near-by pond and, most importantly, by purchasing some of the catch. An on-going relationship with an active promoter from a governmental or private voluntary organization, e.g. CARITAS, together with previous community development experience and an extended family settlement base also contribute to project success.

Despite the diverse origins of the fishpond committees their operation is similar (because it is largely determined by the task environment). Fishpond construction is carried out by the mutual effort of community members. Participation rates are high with men, women and children engaged in construction activities requiring hand labor (land clearing excavation, planting grass banks).

At the fish production stage, families (men, women and children) within the community take turns feeding the fish and, if present, caring for the hogs. This work is carried out on a rotational basis under the supervision of a management committee or leader appointed by the community at DINAAC's request. This committee or leader is also responsible for handling any funds used to purchase fish feed and/or pigs and pig feed.

At harvest time all members of the community interest group participate. The sale and distribution of fish is handled by the fishpond committee leader and women members of the committee.

b. Capacity and Competence of Existing Fishpond Committees

Most existing fishpond committees are highly dependent on DINAAC and other Ministry of Agricultural Development (MIDA) personnel, particularly during the initial year of operation. DINAAC personnel supervise the site selection and construction of fishponds and provide technical backstopping to MIDA production (extension) technicians in the stocking, maintenance and harvesting of ponds. In the case of machine-dug ponds DINAAC usually assists the fishpond committees to make arrangements for pond excavation. In many instances DINAAC also informally extends credit to cover some operating expenditures, e.g., the cost of fingerlings and pelleted fish feed for the initial cycles.

The MIDA production technicians are assigned a key role during the fishpond's first operational cycle. They must provide technical advice on pond maintenance, deliver fingerlings for stocking ponds and feed for the fish and pigs, and keep records of the stocking and harvest, and of financial transactions between DINAAC and the fishpond committees such as credit extended by DINAAC and the repayment of same by the communities as well as community payments for fingerlings or feed.

Activities related to the purchase and sale of pigs and to the provision of pig feed are also handled by the Ministry of Agricultural Development or the Ministry of Health (see below).

Under the current mode of operation there is no special competence required to manage a fishpond aside from a willingness to work and an ability to follow instructions of the production technician. In those instances where fishponds are integrated with other activities, e.g. pig raising or gardens, the level of technical competence as well as organizational coordination must necessarily be higher.

c. Community Participation

Membership on fishpond committees is open to any community member, however, membership is not obligatory. Participation rates in the fishpond projects range from very low to 100% of the community members. The social soundness analysis found that projects which had been more or less imposed by government institutions have low participation rates while those which had arisen through spontaneous community desire for a pond have the highest rates. In the middle are projects which received "helicopter" promotion to develop community interest. The social soundness analysis concluded that, although it is advantageous to have full participation in the smallest communities, communities

seem to be able to manage with only partial participation, particularly if the pond project is "fish only" and if it sells fish to non-members at a higher price than to members. The maintenance and harvesting demands of a simple fishpond are not viewed as excessive by community members and there is little need for full participation. Nevertheless, as additional activities, e.g. pigs and gardens are added, the projects become more complex and labor demands are greater. In such cases the need for fuller community participation is likely to increase.

The analysis demonstrated that the pond projects generally involve men, women and children at various stages of fish cultivation and harvesting. Nevertheless, it is clear that women play a major role in fishpond projects from the outset. In a number of communities with existing fishponds women have, in fact, been the prime movers in such projects and, at least in latino areas, are active in project-related community meeting.

3. Spread Effects - Potential for Replication

Cultivation of fish in freshwater fishponds in Panama is an activity which has spread very rapidly. In less than four years (1976-1979) - 198 ponds were built of which 164 were active at the end of 1979. During 1979 more than 7,500 persons benefitted from these fishponds which yielded a total estimated production of 132,000 lbs. or 1.5 lbs. per person per month.

While a substantial portion of the growth in the number of fishponds is undoubtedly due to the promotional efforts undertaken by DINAAC, the fishpond activity has proven attractive to community groups because: (1) it is a relatively simple technology; (2) the (initial) costs of a fishpond are not seen as prohibitive; and (3) an appraisal of the benefits of fishponds is possible (at harvest) with only casual observation. In a number of cases communities have initiated pond projects themselves, sometimes without technical assistance after ponds have been established in near-by communities.

Furthermore, pond projects have been successfully initiated in diverse cultivated contexts (in both latino and indian areas) and with a variety of organizational arrangements.

These factors indicate that, provided that pond operation is feasible on a permanent basis, there is a high potential for replicating fishpond projects throughout rural Panama.

C. Technical Analysis

A major objective of this project is to test the feasibility of various technologies for raising fish in rural Panama. At the end of the three year, a technological model or models will be selected for nation-wide implementation based on technological

feasibility as well as on nutritional and sociological impact and economic feasibility.

1. Fish Production Technologies to be Tested

In selected communities without any prior fish culture experience, fish culture only, will be introduced. A fishpond will be built and stocked by the GOP. The pond will be of a manageable size, 1,000 $m^2$ - 5,000 $m^2$, and fed and/or fertilized with commercially bought feeds and chemical fertilizers. The culture system employed will be simple. Government assistance in the form of repeated stocking of fingerlings at the rate of 10,000 to 20,000/ha., transport of feeds and fertilizers to the communities, and supervision of the fish harvests will be provided to insure initial success. Unsophisticated and basic culture systems and government subsidies will be necessary to insure success, building community confidence and stimulating the community to expand and improve their fish culture activities.

In communities with prior fish culture success and which demonstrate an interest in improving operations, a more sophisticated level of culture technology will be introduced and tested. Continuous harvest techniques will be introduced which will permit harvesting of the ponds every couple of weeks. One or two additional ponds will be constructed allowing the community to produce their own Tilapia fingerlings. The raising of hogs and/or ducks and chickens will be initiated and associated with fish culture activities. Organic wastes produced in the animal fattening operation will be washed into the fish ponds to feed the fish and fertilize the pond water. Young animals for fattening will be purchased from the government or private sources and transported by extension agents to the communities. In some cases, communities will be taught to reproduce their own animals. Animal feeds bought by the communities will be transported to the fish ponds by fishery extension agents or by private transport services. In advanced and highly motivated communities, vegetable gardens and/or agricultural crops will be integrated with the animal-fish cultures to provide food for humans and animals. Nutrient rich water from the fish ponds will be used to gravity irrigate crops. Enriched pond bottom mud will be transfered to agricultural areas when ponds are drained to increase soil fertility.

An attempt will be made to slowly increase the confidence and abilities of the participating communities so that reliance on government subsidies and costly inputs can be reduced to a minimum.

The level of technology to be introduced will depend on community interest, organization, and fish culture knowledge, Two communities will be chosen to test completely integrated fish, animal husbandry, and agricultural projects.

2. Culture Fish

The principal fish to be cultured will be Tilapia Nilotica. Tilapia Nilotica has been cultured for several years in Panama with good success and is considered to be the best species of Tilapia available for culture in tropical climates. Tilapia Nilotica feeds low on the food chain, consuming phytoplankton, algae and organic matter and permitting efficient use of natural pond food organisms. Tilapia Nilotica are resistant to disease and low levels of dissolved oxygen allowing rural farmers with little fish culture understanding to produce good crops if simple feeding and fertilizing instructions are followed. A wide range of commercially produced rations and agricultural by-products can be used to feed Tilapia Nilotica. Organic and inorganic fertilizers can be used to increase pond water fertility and fish production. Tilapia Nilotica reproduces naturally and easily in earthen ponds allowing the rural farmers an opportunity of producing their own fingerlings.

Other fish species will also be used in an effort to increase fish production. An all-male tilapia hybrid produced by crossing T. Hornorum X female T. nilotica has been raised successfully in Panama and will continue to be utilized. The common carp, a bottom feeder, silver carp, a phytoplankton filter feeder, and the grass carp, a herbivore, will be used in polyculture with the tilapias to increase fish production. However, fingerling production of the Tilapia hybrid and carps will be limited to the government hatchery because of the difficulty in reproducing these species. Data on fingerling production of the different species at the Divisa hatchery is contained in Table IV.C.1.

TABLE IV. C.1.

FINGERLINGS SEEDED IN SMALL AND LARGE PONDS, BY SPECIES, 1978 & 1979

| SPECIES | 1978 | 1979 |
|---|---|---|
| Tilapia Nilotica | 71,145 | 38,900 |
| Tilapia Hybrids | 28,900 | 51,375 |
| Common Carp | 48,230 | 41,785 |
| "Lisa" | 4,050 | -- |
| Grass Carp | 70 | 187 |
| Guapote Tigre | 5,450 | 900 |
| Fresh Water Shrimp | 5.800 | 31,550 |
| Tilapia, Red | | 25 |
| Silver Carp | | 24,500 |
| Big Head Carp | | 2 |
| Carp, "Espejo" | | |
| TOTALS: | 168,600 | 190,000 |

Source: DINAAC

3. Fingerling Production

Fingerlings of all-male Tilapia hybrids and carps will be produced by DINAAC biologists at the Divisa hatchery using techniques well established for reproducing these species. The Divisa hatchery will be enlarged to permit expanded fingerling production. However, an attempt will be made to introduce sytems for producing Tilapia Nilotica fingerlings in the rural communities practicing fish culture.

Two systems for producing Tilapia fingerlings will be tested at the site of large established grow-out ponds.

a. Single pond system - A small spawning pond, 200 $m^2$ to 500 $m^2$, will be constructed near the grow-out pond. Male and female tilapia broodstock will be introduced by the GOP and allowed to reproduce. The offspring will grow in the spawning pond and when they reach a sexable size, 50g., the males will be selected by partial harvest. Fish culturists in each community with initial assistance from extensionists will select and stock the male tilapia into the larger, grow-out pond for fattening. The female tilapia can be consumed by the community or sun dried and used as part of the ration to fatten animals or fish. The male fish can be partially or totally harvested from the grow-out pond when they reach a suitable size. A predator fish, the guapote tigre, may have to be stocked to control tilapia reproduction that results because of accidental stocking of female tilapia.

b. Two Pond System

A second system to be tested involves the construction of two small ponds: a spawning and a nursery pond. The GOP will supply tilapia broodstock which will be stocked into the spawning pond. Small fingerlings will be partially harvested from the spawning pond and transferred to the nursery pond for growth to a readily sexable size. The nursery pond will be totally harvested and the males stocked into the grow-out pond. The nursery pond is prepared and refilled to receive more small fingerlings taken from the spawning pond so that as large male tilapia are harvested from the grow-out pond, small males are available for restocking.

The size of the spawning and nursery ponds in relation to the grow-out pond to produce enough male fingerlings to adequately stock the grow-out pond, 10,000 to 20,000/ha. yr., will have to be tested. Commercially produced rations or animal manures will be used to grow fingerlings to sexable sizes.

Fertilizers and Feeds - A variety of feeds and fertilizers are available and will be tested to determine their economic and technical suitability for raising fish.

A commercial fish ration is produced locally and costs $0.145/lb. The ration is expensive but has proven successful in producing high standing crops of fish. Commercial pig and chicken rations are also available for $0.10/lb. and can be used to feed fish. Fish are fed at 3% of their body weight daily and about 1.5 to 2.5 lbs. of ration are consumed per pound of fish produced.

With the introduction of the integrated animal husbandry/fishpond projects, manure from the animals (pigs, ducks) will serve as the primary food source.

4. Construction of New Ponds

The technologies to be tested will require that new ponds be constructed. These include both production (growout) ponds and reproduction (spawning or nursery) ponds. The precise number of ponds to be constructed will depend on final pond site selection, however, it is expected that the 20 demonstration fish-pond projects will provide at least 6 hectares of new water for fish culture. Spawning and nursery ponds will be smaller in size and range between 200 $m^2$ and 500 $m^2$ depending on the number of male tilapia fingerlings needed to stock the growout pond. Growout ponds will be larger and range in size from 1000 $m^2$ to 5000 $m^2$ depending on pond site and population size of the participating community. All ponds will be machine dug and paid by for project funds. A minimum of 85% or 5.1 hectares of the new acreage will be in growout ponds. An average of 15,000 lbs./ha./yr. of fish has been produced in Panama in similar projects therefore at least an additional 76,500 lbs. of fish per year could be produced by rural Panamanian when all 20 pond projects are implemented without considering the improvement in pond productivity which should occur as a result of the project.

D. Administrative Analysis

The proposed institutional arrangements for implementing a large scale managed fish production program have been assessed and, in some cases, modified as part of the project design process. The proposed administrative mechanisms appear to be sound. Nevertheless, many factors related to the administration of a fish production program are not yet fully tested and their feasibility is not certain. The administrative feasibility of a large scale managed fish production program will be fully assessed as part of

the project's program's effectiveness study. The major questions of administrative feasibility which have been identified relate to: (1) the internal organization of the Ministry of Agricultural Development; (2) the supply of services to the communities, especially credit and (3) the nature of the community organizations which will implement fishpond projects (discussed in the social soundness analysis).

1. Internal Organization of MIDA

MIDA's internal arrangements (structure) for administering a fish pond program have been assessed and are considered to be generally adequate (see Annex VIII)but must be strengthened in several areas. The program is coordinated through the National Directorate of Aquaculture, but primary implementation responsibilities rest with Aquaculture personnel in Regional MIDA's Directorates which are responsible for MIDA's outreach activities. The National Directorate of Aquaculture has been the primary force behind the rapid proliferation of fish ponds in Veraguas and, to a lesser extent, Coclé province. It is responsible for promoting specific aquaculture activities, for providing specialized technical assistance and supervision of fishpond projects during the construction and implementation phases, and for providing fingerlings to communities and individuals who have fishponds as well as for carrying out applied research in fish culture, also at Divisa. Until recently, all activities, except for fingerling production at the hatchery in Divisa, Veraguas, were centralized in the headquarters office in Santiago, Veraguas.

Outreach activities involving direct contact with client groups have now been relocated to offices in the regional Directorates in Veraguas and Coclé provinces. DINAAC extension personnel in these offices work only on fish culture activities but they report directly to the regional directorates. As the managed fish program expands, DINAAC extension personnel will also be located in other Regional Directorates. Under this structure the central DINAAC office is responsible for establishing policies governing program activities, for establishing criteria for selection and approval of individual pond projects, for developing and disseminating technical knowledge about fishpond construction, for setting standards for fish pond construction, for training of national and regional staff as well as of personnel who operate ponds, for producing fingerlings used to stock ponds, for assuring appropriate financing for aquaculture activities and for monitoring and evaluating activities of the regional offices. The regional offices will, however, be directly responsible for promoting and providing services for fishpond projects.

In order for this structure to work well, it is necessary to provide sufficient resources to DINAAC personnel located in the regional offices so that they can effectively carry out their outreach activities and to establish a support mechanism within DINAAC which will provide specialized technical assistance and support services to the regional personnel. At a minimum the regional staff must be trained in pond management techniques. They must also be provided with vehicles, as well as a small revolving fund and access to or material inputs for pond construction and operation.

DINAAC's technology transfer office, which has been created, but is not yet fully operational, will be primarily responsible for providing technical backstopping and support for promoting fishpond activities. It will be staffed and provided with material support and external technical assistance to assure its adequate development. Adequate staffing in both the regional directorates and DINAAC's technology transfer office early in the project will be a key ingredient in successful project implementation. The GOP will be expected to agree to a specific covenant that these personnel will be in place not later than six months after the signature of the project agreement. Compliance with this covenant will allow the internal organizational structure to be developed, evaluated and, if necessary adjusted during the implementation of the pilot project.

2. The Supply of Services to the Communities

Successful development of on-going, productive fishpond projects will depend to a high degree on the effectiveness of MIDA's outreach capability during the initial organizational phase and first year or two of pond project operations. DINAAC's "extension" or "production" agents located in the various regional directorates will be the key element in the successful implementation of any community oriented managed fish production activity. In order to fully meet project requirements at least four new regional staff members will be hired from among twenty students who are now enrolled in a two year course of study in aquaculture at the Santiago Veraguas Regional Center of the University of Panama. These new agents will devote a major portion of their time to the demonstration pond activities but will gradually assume additional outreach responsibilities. NOTE: DINAAC also plans to add an additional four agents who would not be directly involved in the demonstration pond activity. Both the new and the old staff will participate in in-service training activities to ensure that they are well-qualified to undertake outreach activities. In order to enhance the effectiveness of the agents four vehicles will be supplied and a revolving fund credit is to be expended.

The administration of this revolving credit fund will receive special attention in the program impact study during the project since analysis carried out during project design indicates that this should be administered by the outreach personnel, if possible, because of the additional flexibility, vis a vis bank credit, which it affords. A small currently existing revolving fund of less than $1,000 has been successfully administered by DINAAC. This fund will be expanded to approximately $30,000 and will be administered by the extension agents in the regional offices. Utilization of the fund will be subject to the general supervisory authority of DINAAC and to financial control by auditors from the GOP's General Controller's Office who are located in each regional directorate. In some instances disbursements from the fund will be used to directly finance the acquisition by MIDA of inputs for pond activities which will be then provided in kind to the community on a reimbursable basis. In other cases cash transfers will go directly to the participating communities which will then acquire required inputs. This system is intended to provide maximum flexibility while maintaining reasonable control of the funds. This system appears to be administratively more feasible than arranging for formal credit through the Agricultural Development Bank.

E. Environmental Concerns

The managed fish pond project is not expected to cause any harmful environmental or public health problems. Concern exists as to the use of animal wastes to fertilize fish pond water and the possible injurious effects on public health. Fish and animals have been raised together for years in many countries and no ill effects have been documented. Fish raised with animals will be well cooked before eating, killing any disease organisms found in the flesh.

Fish ponds serve as a type of oxidation lagoon, reducing the BOD in organic wastes before the effluent is released into the natural waters. Adding fish to these ponds improves the water quality of the pond. Fish consume organic material and microscopic algae that grow on the nutrients released from the animal wastes during decomposition and thereby improve water quality. As long as the number of animals raised do not produce more manure that can be decomposed in the pond, effluent from fish ponds should not prove harmful to natural water systems.

The introduction of fish exotic to Panama for culture in ponds is controversial but has not caused problems in other tropical countries with similar programs. Species to be utilized in this project have already been introduced to Panama by knowledgeable Panamanian authorities. Several species are unable to

reproduce in small streams and ponds and must be artificially induced to spawn in a hatchery. Tilapia, the principal species to be cultured, has been in Panama for over 10 years and has not caused any ecological problems to date.

## V. Financial Analysis

This grant will be incrementally funded. Of the total grant of $992,000, $100,000 will be obligated in FY80, $500,000 during FY 81 and 392,000 during FY 82.

The summary cost estimate and financial plan is shown on pages 16 and 17 and the evaluation of line item cost is described in detail in the Financial Analysis Annex. This section summarizes what is to be financed and evaluates the GOP counterpart contribution and ability to meet recurring cost beyond the life of the project. This section also describes disbursements method to be used and includes a concluding statement relating to the projects appropriateness for AID financing.

### Project Outputs

These funds will finance feasibility studies, demonstration pond projects, technical assistance, training, hatchery expansion and vehicle purchases. GOP counterpart funds will finance additional personnel for MIDA's staff, per diem expenditures and other operational expenditures related to the project such as hatchery operation, and vehicle operation and maintenance, and some costs associated with training. Both grant and counterpart funds will be used for a small revolving fund to finance expenditures by communities participating in the demonstration pond projects.

### GOP Counterpart Contribution - Section 110 FAA Requirement

During the life of this project the GOP will be required to contribute $640,000 to this project. Table III has been prepared to show the timing of GOP resource requirements by GOP fiscal year (GOP fiscal year is January through December). To date GOP has already allocated $100,000 of FY 80 money to get this project started and has given USAID/Panama verbal assurance additional funds will be made available as needed. The use of incremental funding for this grant gives AID the opportunity of examining counterpart contribution each time a new ProAg amendment is signed.

### Disbursement Procedures

To assure that AID and GOP contributions occur evenly throughout the life of the project, it is contemplated that the FAR reimbursement system will be used to reimburse the GOP for

demonstration ponds, swine pens and hatchery ponds. A.I.D. participation in the demonstration ponds will be on an 82/18 percentage basis. The percentage of participation in the hatchery ponds has yet to be determined. Direct reimbursement will be used to finance the hatchery laboratory construction and purchase of other equipment and material.

Recurring Costs

This is a small project. Its purpose is to develop self-sufficient ponds and to determine if large scale investment at a later date is warranted. In the worst case if zero self-sufficiency were to be obtained, the recurring cost to maintain the ponds and additional staff to provide extension services would be:

| | |
|---|---|
| Operating cost of 10 typical Type A pond[1/] | $18,760 |
| Operating cost of 5 typical Type B ponds | 4,650 |
| Operating cost of 5 typical Type C ponds | 1,876 |
| Sub-total | 25,286 |
| Four extension agents | 37,500 |
| Total | $62,786 |

Hatchery operation cost and transportation of fingerlings to remote locations has been taken into consideration in operating cost by assuming that cost per fingerling is $.04. The project studies to be financed under the grant will determine what the success is at what cost. Should the studies reveal that cost exceeds the social benefits or that the incidence of success is too small, no recurring cost will be incurred and the project will be terminated. If the project is continued on a social basis the projected loss at zero self-sufficiency can be absorbed by the Central Treasury with minimum impact.

Conclusions and Recommendations

Although revenue may accrue as a result of this project, its immediate objective is to generate information; consequently neither a net present value analysis nor an examination of the internal rate return was performed. Table I of Annex III shows the projected expenditures of all funds over the life of the project and Tables II and III of the same Annex show the project flow of AID and GOP resources based on the earmarking concept.

1/ Please refer to Annex III for definitions of Type A, B and C ponds. Costs are stated in US dollars.

## VI. Implementation Planning

### A. Implementation Responsibilities

The project will be implemented by the Ministry of Agricultural Development (MIDA). Specific management responsibility will be located in the National Aquaculture Directorate (DINAAC) which will implement project activities directly and through participating regional directorates of MIDA. The Director of DINAAC will be designated as the project manager; however, he will delegate most responsibilities to the head of DINAAC's Technology Transfer Department. The long-term technical assistance included in the project will also have substantial management responsibility for certain project activities e.g. training (fishculture expert) and feasibility studies (anthropologist). The Mission's Agriculture and Business Development Office will have primary project monitoring responsibility.

### B. Procurement

#### 1. Procurement of Goods and Services

Procurement of goods other than vehicles is expected to be done locally. MIDA has a centralized procurement office which can procure goods for the project but which is characterized by extremely lengthy procurements. Because the amount of procurement of goods for the project is relatively small, DINAAC proposes to undertake its own local procurement as MIDA's Directorate of Renewable Natural Resources and Directorate of Indian Affairs do under other AID financed project This will require assignment to DINAAC of an auditor from the General Controller's Office.

#### 2. Procurement of Construction Services

Both hatchery ponds and demonstration ponds will be excavated during the project. MIDA arquitects will design the hatchery expansion while design and supervision of construction of demonstration ponds will be done by MIDA personnel trained in pond construction. The majority of pond excavation will be done by bulldozers, although excavation of small demonstration pond excavation may be done by hand. DINAAC will arrange for the major part of pond construction to be done by ENDEMA, the National Machinery Enterprise which is a dependency of the Ministry of Agricultural Development, or, if necessary, from private contractors. In some cases, however, it may be possible to utilize equipment from public sector entities in exchange for fuel and operators services.

In order to simplify reimbursement procedures for the pond construction activities MIDA and USAID/Panama have agreed in principle to establish a Fixed Amount Reimbursement (FAR) procedure. The feasibility of using the FAR method for pond construction will be further studied prior to initiation of the project and final agreement on the FAR system will be one of the initial actions during project implementation.

3. Procurement of Technical Services

There are two major procurement actions required. These are to contract for the long-term assistance of a fish-culture expert and an anthropologist. Although it is possible that these will be contracts with individuals, at least one contract may be with a university. The record of host country contracting for U.S. technical assistance in Panama is mixed. Often these contracts require many months to be signed by the GOP after they have been fully negotiated. In view of the importance of this technical assistance for the Project - it is a condition precedent to disbursement for most activities - the Mission will carefully evaluate whether there is a need to make an exception to AID policy encouraging host country contracting to contract these experts in order to assure their timely arrival.

C. Time-phased Implementation Plan

A time-phased implementation plan is included as Annex IV. A to this Project Paper.

## VII. Evaluation Arrangements

The purpose and design of this project will complete evaluation of project activities. A separate evaluation activity which goes beyond the reporting requirements of the PES will not be necessary since the program effectiveness, consumption impact and economic financial feasibility studies are all evaluative in purpose. Together they will constitute a comprehensive evaluation of the managed fish production project.

Complete baseline data will be gathered as the first step in implementing the feasibility studies and project impact will be routinely measured during the end of the project as part of

these studies. In addition to the feasibility studies, USAID/ Panama and MIDA will, however, conduct joint annual evaluations to ascertain progress in implementation. Each evaluation will be summarized in a document, which consist of brief status reviews of progress toward completion of each project output, major pending actions which must be taken to attain each output, major problems or obstacles achieving outputs, if any, and proposed means to overcome these obstacles. The first evaluation will occur nine months after initiation of the project so that the evaluations will serve as bases for preparation of the project's annual implementation plans.

## VIII. Conditions, Covenants, and Negotiating Status

The project has been developed through the close coordination of MIDA's National Department of Aquaculture and AID Mission Staff. Project design has been discussed with MIDA's sectoral planning office and the Ministry of Planning and Political Economy which has included $100,000 in the GOP's 1980 Investment Budget as counterpart for the project.

There are no major issues which remain to be negotiated. A request to finance this project has been received from the Ministry of Planning and Political Economy. A draft grant project agreement is being prepared and it is expected that negotiation and signature would take no longer than one month from the date of authorization.

The GOP will covenant that within the first six months of the project two additional staff members, one of whom will be designated by the department chief, will be added to the Technology Transfer Department of the National Directorate of Aquaculture and four additional staff members will be added to regional to the Ministry of Agricultural Development who will be permanently assigned to fresh water aquaculture activities on a full time basis. These additional staff are required to assure that the project activities described in the PP can be carried out in a satisfactory manner. Also, the GOP shall covenant that an auditor from the Controller General's Office will be assigned to DINAAC during the life of this project. The purpose of this covenant is to accelerate local procurement of goods financed under the grant.

For grant-financed activities other than technical assistance, training, vehicle purchase, and hatchery pond construction, signed contracts for the long-term technical assistance (fish culture expert

and anthropologist) will be established as a condition procedent to disbursement. The purpose of this condition is to insure that there is adequate planning for and coordination of the feasibility studies and demonstration pond projects.

República de Panamá

Ministerio de Planificación y Política Económica



Panamá, 28 de agosto de 1980
ATI-1161

Señor
Aldelmo Ruíz
Director
Agencia para el Desarrollo
Internacional
E. S. D.

OFF DIR D/DIR CONT ECO EDU DP DR TEAM ENG RCO LMD AAG IIS RHUDO EMB CLR ST INF

Señor Director:

El Gobierno Nacional realiza significativos esfuerzos para desarrollar programas de producción de peces en aguas continentales. Para el logro de este objetivo requerimos de la utilización de recursos de cooperación técnica internacional, como apoyo a los proyectos iniciados.

Consecuentemente solicitamos a la Agencia a su cargo, asistencia técnica y financiera no reembolsable, por un total de B/.992,000.- durante un periodo de tres (3) años. El proyecto tendrá como propósito principal evaluar la necesidad y factibilidad de desarrollar un programa masivo de producción de peces, a nivel nacional; para este propósito se ejecutará un Plan Piloto y de demostración de proyectos en estanques, y se realizarán investigaciones para fortalecer la capacidad técnica institucional del Ministerio de Desarrollo Agropecuario (MIDA), para llevar a cabo la promoción y apoyo de actividades de estanques comunitarios.

La Dirección Nacional de Acuicultura del MIDA, ejecutará las actividades del Proyecto.

Atentamente,

Abdiel F. Julio V.,
Viceministro

Adj: lo indicado

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US AID PANAMA
COMMUNICATION

# 5C(1) - COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Asistance and Economic Support Fund.

## A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

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| 1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? | Yes. |
| 2. FAA Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the United States unlawfully? | No. The Government of Panama is actively cooperating with U.S. and international agencies in the control of illicit drugs and narcotics traffic. |
| 3. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement? | Yes, it has been so determined. |
| 4. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government? | The GOP is not known to be indebted under any of these circumstances to any U.S. citizen for goods and services furnished or ordered. |
| 5. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? | No. |

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| 6. FAA Sec. 620(a), 620(f); FY 79 App. Act, Sec. 108, 114 and 606. Is recipient country a Communist country? Will assistance be provided to the Socialist Republic of Vietnam, Cambodia, Laos, Cuba, Uganda, Mozambique, or Angola? | No in both cases. |
| 7. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression? | No. |
| 8. FAA Sec. 620 (j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property? | Adequate measures have been taken to protect U.S. property. |
| 9. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? | The U.S.-Panama agreement relating to investment guarantees entered into force March 8, 1962. |
| 10. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters: | One vessel was seized in early 1974. |
| a. has any deduction required by the Fishermen's Protective Act been made? | No. |
| b. has complete denial of assistance been considered by AID Administrator? | Such a denial was considered by the A.I.D. Administrator and deemed not in the U.S. interest. |
| 11. FAA Sec. 620; FY 79 App. Act, Sec. 603. (a) Is the government of the recipient country in default for more than 6 months on interest or principal of any AID loan to the country? | (a) No. |
| (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds? | (b) No. |
| 12. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the | Yes, as reported in annual report on implementation of Sec. 620(s). |

A.12.

amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking Into Consideration" memo: "Yes, as reported in annual report on implementation of Sec. 620(s)." This report is prepared at time of approval by the Administrator of the Operational Year Budget and can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

13. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? — No.

14. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? — Panama is not delinquent with respect to dues, assessments, or other obligations to the U.N. for the purposes of Article 19 of the Charter.

15. FAA Sec. 620A, FY 79 App. Act, Sec. 607. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? — No.

16. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA? — No.

17. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty? — No.

B. FUNDING CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

a. FAA Sec. 102(b)(4). Have criteria been established and taken into account to assess commitment progress of country in effectively involving the poor in development, on such indexes as: (1) increase in agricultural productivity through small-farm labor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment, and (6) increased literacy? — Yes

6.1.

b. FAA Sec. 104(d)(1). If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, and assistance to urban poor? — No.

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights? — N/A

b. FAA Sec. 533(b). Will assistance under the Southern Africa program be provided to Mozambique, Angola, Tanzania, or Zambia? If so, has President determined (and reported to the Congress) that such assistance will further U.S. foreign policy interests? — N/A

c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made? — N/A

d. FY 79 App. Act, Sec. 113. Will assistance be provided for the purpose of aiding directly the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights? — N/A

e. FAA Sec. 620B. Will security supporting assistance be furnished to Argentina after September 30, 1978? — N/A

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? Yes
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PRODUCT? Yes

A. GENERAL CRITERIA FOR PROJECT

| | |
|---|---|
| 1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure)? | An Advice of Program change was sent to the congress on 7/28/80 |
| 2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance? | Yes. |
| 3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance? | No legislative action required. |
| 4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973? | N.A. |
| 5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project? | N.A. |
| 6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. | No |

A.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

The project will improve the technical efficiency of agriculture.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

N.A.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

The GOP will provide the equivalent of $640,000 for salaries of technicians, equipment purchase and operating expenditures required for the project.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No.

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes.

12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?

N.A.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained

The project will be implemented in the poorest rural Panamanian communities adapted to Panamanian conditions. It will be implemented by community members who have organized themselves to help themselves. Women constitute a

B.1.a.

basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

significant percentage of the membership of these groups and, in many communities, exercise leadership roles.

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

The project directly increases the standard of living of the rural poor by increasing availability of low cost protein at local levels.

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(ii) to help alleviate energy problems;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

B.1.b.(4).

(v) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

c. [107] Is appropriate effort placed on use of appropriate technology? — Yes.

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)? — Yes.

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"? — No.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government. — The project encourages local community groups to organize themselves to work together in an economically productive endeavor, to improve their own nutritional well-being.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth? — Yes.

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

# PROJECT AUTHORIZATION

Name of Country: PANAMA

Name of Project: Managed Fish Production
Project Number: 525-0216

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Managed Fish Production project for Panama involving planned obligations of not to exceed $992,000 in grant funds over a 3 year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project consists of assisting Panama's Ministry of Agricultural Development to expand freshwater fish production in Panama in developing its institutional capabilities, by conducting a pilot program in several rural communities, and by conducting studies to demonstrate the need for and feasibility of a large-scale managed fish production program.

3. The Project Agreement which may be negotiated and executed by the officers to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

4.a. Source and Origin of Goods and Services

Goods and services except for ocean shipping, financed by A.I.D. under the Project, shall have their source and origin in Panama or in the United States, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall except as A.I.D. may otherwise agree in writing be financed only on flag vessels of the United States.

b. Conditions Precedent to Disbursements

Prior to the disbursement under the Grant, or to the issuance by A.I.D. of documentation by which disbursement will be made for any purpose other than to finance (i) technical assistance, (ii) long-term training in the United States or (iii) construction of

hatchery ponds (iv) or vehicles, Panama will, except as A.I.D. may otherwise agree to writing, furnish in form and substance satisfactory to A.I.D. evidence that arrangements have been made for the provision of long-term technical assistance.

c. Covenant

Panama covenants that, within the first eighteen months from the date of signing of the Project Agreement, two professional staff members, one of whom shall be designated as department chief, shall be assigned to the Technology Transfer Department of the National Directorate of Aquaculture and at least four staff members located in regional directorates shall be assigned on a full time basis to aquaculture activities related to implementation of this project. These staff members shall be in addition to those staff members already employed by the National Directorate of Aquaculture and the regional directorates.

Aldelmo Ruiz
Director
USAID/Panama

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BJECT: DAEC REVIEW OF THE MANAGED FISH PRODUCTION PID

THE DAEC REVIEWED THE SUBJECT PID ON SEPTEMBER 20, 1979 D APPROVED IT SUBJECT TO SUBMISSION OF AN INTERIM REPORT.

THIS IR SHOULD COVER THE FOLLOWING ISSUES AND BE BMITTED BY JANUARY 31, 1980.

PROJECT STRATEGY.

) GOAL LEVEL. THE PROJECT GOAL IS TO IMPROVE THE TRITIONAL STATUS OF THE PANAMANIAN RURAL POOR. HOWEVER, E PID DOES NOT CLEARLY DESCRIBE HOW THE PROPOSED PROJECT TIVITIES WOULD ACHIEVE THAT GOAL. WHETHER THE STRATEGY TO IMPROVE NUTRITION THRU ON-SITE CONSUMPTION OR AS A SULT OF INCREASED INCOME OBTAINED FROM COMMERCIAL FISH ODUCTION, THAT STRATEGY SHOULD BE CLEARLY STATED AND PLAINED, AND THE MEANS FOR CARRYING OUT THE STRATEGY OULD BE FULLY DESCRIBED. TO THE EXTENT THAT THE PROJECT NTEMPLATES COMMERCIAL FISH PRODUCTION, THE SUBSIDIZATION THE COSTS OF CONSTRUCTING AND OPERATING THE FISH PONDS COMES QUESTIONABLE AND ANY SUCH PROPOSAL WOULD HAVE TO BE

DEQUATELY JUSTIFIED.

) PURPOSE LEVEL. THE PROJECT STRATEGY AT THE SUB-PUR- SE LEVEL SHOULD BE CLARIFIED IN THE IR. IS IT TO IN- EASE GOP CAPACITY TO CARRY OUT A NATIONWIDE PROGRAM OF SH PRODUCTION, OR TO ESTABLISH GOP CAPABILITY TO ALUATE THE NEED FOR AND FEASIBILITY OF SUCH A NATIONWIDE OGRAM? THE LATTER SEEMS MORE DESIRABLE, BUT IF MISSION TS FOR THE FORMER THE IR SHOULD CONTAIN AMPLE JUSTIFI- TION. IN EITHER CASE THE PROJECT COMPONENTS SHOULD FLECT THIS STRATEGY DECISION. PLEASE NOTE THAT THE SCUSSION ON SUCH PROJECT COMPONENTS IS NOT NECESSARY FOR VIEW OF THE IR AND MAY BE HELD FOR THE PP.

. COMMUNITY ORGANIZATIONS. THE NATURE OF THE COMMUNITY GANIZATIONS AND THE MANNER IN WHICH THEY WOULD FUNCTION S NOT CLEARLY SET FORTH IN THE PID. THE INTERIM REPORT OULD TREAT THESE SUBJECTS IN DETAIL, ANSWERING SUCH ESTIONS AS THE FOLLOWING:

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(1) WHAT KIND OF ORGANIZATIONS ARE ENVISIONED? WHAT HAS BEEN THE EXPERIENCE WITH THESE ORGANIZATIONS IN OTHER ACTIVITIES (INCLUDING PRESENT FISH POND OPERATION)? HOW PREVALENT ARE THESE ORGANIZATIONS IN PANAMA? WHAT IS THE NATURE OF THEIR COMPETENCE AND CAPACITY, AND HOW WILL THIS BE APPRAISED IN THE SELECTION PROCESS? WHAT RESOURCES ARE CURRENTLY AVAILABLE THAT COULD BE USED TO STRENGTHEN THE ORGANIZATIONS? WHAT WILL BE THE LEGAL FORM OF THE ORGANIZATIONS? WHAT WILL BE THE RESPONSIBILITIES, DUTIES, LIABILITIES OF THEIR MEMBERS? HOW ARE DECISIONS MADE? WHO MAY JOIN? IS MEMBERSHIP OPEN TO ANYONE WHO WISHES TO PARTICIPATE IN THE PARTICULAR PROJECT? WHAT ABOUT EXISTING MEMBERS WHO DO NOT WISH TO PARTICIPATE? IN THE EVENT THE ORGANIZATION CONTRACTS CREDIT, TO WHAT EXTENT IS AN INDIVIDUAL MEMBER LIABLE FOR REPAYMENT, INCLUDING ANY MEMBER WHO DOES NOT WISH TO PARTICIPATE IN THE PROJECT?

C. INITIAL ENVIRONMENTAL EXAMINATION (IEE). A REVIEW OF THE IEE SUBMITTED WITH THE PID RAISED THE FOLLOWING CONCERNS OVER THE PROJECT'S POSSIBLE IMPACT ON THE PHYSICAL AND HUMAN ENVIRONMENT: (1) INFECTION OF FISH INTENDED FOR HUMAN CONSUMPTION BY VIRUSES AND OTHER PATHOGENIC ORGANISMS FROM LIVESTOCK WASTES THAT MAY NOT BE ADEQUATELY COMPOSTED; (2) DAMAGE TO LOCAL ECOSYSTEMS RESULTING FROM THE INTRODUCTION OF EXOTIC FISH SPECIES; AND (3) REDUCTION IN THE QUALITY OF WATER IN STREAMS AND RIVERS BECAUSE OF THE POND DRAINING AND FLUSHING. THE MISSION IS REQUESTED TO EXAMINE THE POSSIBLE IMPACT OF THESE CONCERNS AND SUBMIT ITS FINDINGS WITH THE INTERIM REPORT. THE IEE WILL BE HELD IN ABEYANCE UNTIL THESE CONCERNS ARE RESOLVED.

3. ASSUMING APPROVAL OF THE IR, THE PROJECT PAPER SHOULD DEAL WITH THE FOLLOWING QUESTIONS AND CONCERNS RAISED DURING THE DAEC.

A. SELECTION CRITERIA. THE COMMUNITY SELECTION CRITERIA REQUIRE ONLY THAT A COMMUNITY BE LOCATED IN A DISTRICT WITH A SERIOUS INCIDENCE OF MALNUTRITION. BECAUSE NUTRITIONAL STATUS CAN VARY BY COMMUNITIES WITHIN A DISTRICT, THE MISSION SHOULD CONSIDER INCLUDING CRITERIA THAT WOULD VERIFY THE NEED FOR THE PROJECT AT THE COMMUNITY LEVEL. IN THIS REGARD, IT WAS SUGGESTED THAT THE MISSION MAY WANT TO CARRY OUT RANDOM SAMPLE ANTHROPOMETRIC SURVEYS TO MEASURE COMMUNITY NEED. IN ADDITION, TWO OF THE SELECTION CRITERIA APPEAR TO BE INCONSISTANT. THE FIRST REQUIRES THAT 75 PERCENT OF A COMMUNITY'S POPULATION BE AMONG THE POOREST 20 PERCENT OF ALL PANAMANIANS AND THE SECOND REQUIRES THAT THE PROSPECTIVE POND SITE BE ACCESSIBLE TO AN EXISTING ROAD OR WATERWAY THAT IS USABLE YEAR ROUND. HOWEVER , SINCE THE VERY POOREST MEMBERS OF THE POPULATION

MAY OFTEN LIVE IN AREAS WITH LIMITED ACCESSIBILITY, THE MISSION SHOULD EXAMINE WHETHER THE ACCESSIBILITY CRITERION MIGHT IN FACT LIMIT THE ABILITY OF THE PROJECT TO REACH THE VERY POOR (LOWEST 20 PERCENT).

B. EXTENSION SERVICE. THE PROJECT RELIES HEAVILY ON SUPPORT FROM PANAMA,S EXTENSION SERVICE EVEN THOUGH THAT SERVICE IS WEAK AND DISAGGREGATED. DURING INTENSIVE REVIEW THE MISSION SHOULD EXAMINE THE ADEQUACY OF PROPOSED ARRANGEMENTS FOR THE PROVISION AND TRAINING OF EXTENSION AGENTS TO INSURE THAT A SUFFICIENT NUMBER OF APPROPRIATELY TRAINED AGENTS WILL BE MADE AVAILABLE TO THE PROJECT ON A TIMELY BASIS.

C. RELATION TO OTHER PROJECTS. THE MISSION IS CURRENTLY DEVELOPING OR IMPLEMENTING OTHER NUTRITION RELATED PROJECTS IN RURAL AREAS, INCLUDING THE CHILD AND FAMILY ORIENTATION CENTERS (COIF) PROJECT (525-0202) AND THE RURAL HEALTH DELIVERY SYSTEM LOAN (525-U-045). OTHER INTERNATIONAL DONORS ARE ALSO IMPLEMENTING NUTRITION RELATED PROJECTS. SINCE THERE APPEARS TO BE LITTLE COORDINATION AMONG THE PROJECTS, THIS COULD RESULT IN DUPLICATION AND THE INEFFICIENT USE OF RESOURCES. ALTHOUGHTHE COIF PROJECT PROPOSES A SOLUTION TO ALLEVIATE THIS PROBLEM AT THE LOCAL LEVEL, IT WILL NEED TO BE

ADDRESSED AT THE NATIONAL LEVEL AS WELL. THEREFORE, AS PART OF THE INTENSIVE REVIEW PROCESS FOR BOTH THIS AND THE COIF PROJECTS, THE MISSION SHOULD EXAMINE THE NEED TO ESTABLISH A NATIONAL LEVEL COORDINATION MECHANISM FOR NUTRITION PROJECTS.

D. CONSTRUCTION/PROCUREMENT. DURING INTENSIVE REVIEW THE MISSION SHOULD EXAMINE THE CAPACITY OF THE NATIONAL DIRECTORATE FOR AQUACULTURE TO CARRY OUT ALL PROCUREMENT ACTIONS REQUIRED UNDER THE PROJECT. A PROCUREMENT PLAN SHOULD BE INCLUDED IN THE PP. IN PARTICULAR, THIS PLAN SHOULD INDICATE HOW CONSTRUCTION ACTIVITIES WILL BE CARRIED OUT.

E. RELATION TO DEVELOPMENT PROGRAM. THE MISSION'S PRESENT COUNTRY STRATEGY (EXPRESSED IN ITS LATEST CDSS) CALLS FOR A GENERAL SHIFT IN FOCUS FROM THE RURAL TO THE URBAN SECTOR. THE PP SHOULD CAREFULLY EXPLAIN THE RELATIONSHIP OF THIS PROJECT TO THE BROADER MISSION DEVELOPMENT PROGRAM.

F. PROJECT FUNDING. THE FY 80 BUDGET SUBMITTED BY IDCA TO OMB DOES NOT CONTAIN FUNDS FOR THE PROPOSED PROJECT AND IT IS DOUBTFUL THAT ADDITIONAL FUNDS FOR THIS PROJECT WILL BECOME AVAILABLE. HOWEVER, WITHIN THE BUDGET LEVEL ESTABLISHED FOR PANAMA (SEE STATE 260925), THE MISSION MAY REALLOCATE FUNDS TO COVER THIS PROJECT. VANCE
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SUBJECT: MANAGED FISH PRODUCTION INTERIM REPORT (PROJECT NO. 525-2216)

REF.: 79 STATE 278869

1. LAC BUREAU HAS REVIEWED AND APPROVED SUBJECT INTERIM REPORT (IR). HOWEVER, ALTHOUGH APPROVED, [illegible] SEVERAL CONCERNS WHICH MAKE IT IMPOSSIBLE TO [illegible] PROJECT APPROVAL/AUTHORIZATION AUTHORITY TO MISSION AT THIS TIME. THEREFORE, REQUEST THAT MISSION CABLE REVISED SUBJECT AND PROJECT ACTIVITY DESCRIPTION [illegible] REVIEW. IMMEDIATELY AFTER RECEIPT, [illegible] ASSUMING CONCUR [illegible], WILL AUTHORIZE MISSION TO [illegible] PP APPROVAL AND PROJECT AUTHORIZATION.

2. DURING REVIEW OF IR, A NUMBER OF QUESTIONS [illegible] CONCERNING PROJECT STRATEGY AND PURPOSE, INCLUDING DEGREE TO WHICH PROJECT DESIGN HAS BEEN MODIFIED SINCE [illegible] TO FOCUS ON NUTRITIONAL OBJECTIVES. APPROPRIATE PURPOSE APPEARS TO BE TWO-FOLD -- I.E., EVALUATING GAINS AND FEASIBILITY -- IR DESCRIBES ONLY ACTIVITIES RELATING TO FEASIBILITY QUESTION. IN ORDER TO CLARIFY THESE POINTS, REQUEST [illegible] CABLE BUDGET ASAP WHICH REFLECTS CHANGES IN PROJECT FOCUS BETWEEN PID AND IR (OR PP). [illegible]

3. REGRET DELAY IN ADVISING RE STATUS OF IR REVIEW. RECOGNIZING THAT MISSION IS MOVING FORWARD QUICKLY WITH PP, PROMISE MUCH MORE RAPID RESPONSE TO CABLE BUDGET INFO. PLEASE NOTE THAT PRELIMINARY OYB FOR PANAMA DOES NOT INCLUDE MANAGED FISH PRODUCTION PROJECT. WE WILL ATTEMPT IF AND WHEN FUNDS BECOME AVAILABLE. ALSO, ONCE [illegible] FEASIBLE, WILL FORWARD CONGRESSIONAL NOTIFICATION. [illegible]
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AID 1020-28 (7-71)
SUPPLEMENT I

# PROJECT DESIGN SUMMARY
## LOGICAL FRAMEWORK

(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE PAR REPORT. IT NEED NOT BE RETAINED OR SUBMITTED.)

Life of Project:
From FY 1980 to FY 1983
Total U.S. Funding $992,000
Date Prepared: September 1980

Project Title & Number: MANAGED FISH PRODUCTION 525-0216

PAGE 1

| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | MEANS OF VERIFICATION | IMPORTANT ASSUMPTIONS |
|---|---|---|---|
| Program or Sector Goal: The broader objective to which this project contributes: | Measures of Goal Achievement: | | Assumptions for achieving goal targets: |
| Sector Goal: | | | |
| To improve the nutritional status of the rural poor. | Within 5 years of projection completion 20,000 persons will increase their daily animal protein intake by 5 to 10 grams. | Nutrition Surveys | 1. Protein intake increases as a result of managed fish production.<br>2. Other conditions affecting nutritional status of rural Panamanians do not negate positive impact of increase animal protein consumption. |
| Program Goal: | | | |
| To establish a network of freshwater fishponds in poor rural communities throughout Panama. | Within 5 years of project completion 200 new continuous harvest fishponds are in operation throughout Panama. | DINAAC Records | 1. Project findings justify implementation of a large scale managed fish production program.<br>2. Demonstration Ponds and extension activities result in "spin-off" ponds.<br>3. The GOP can finance a large scale activity -- perhaps with IDB fundings.<br>4. MIDA extension agents are not diverted entirely to other activities. |

AID 1020-20 (7-71)
SUPPLEMENT I

# PROJECT DESIGN SUMMARY
## LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U. S. Funding _____
Date Prepared: _____

Project Title & Number: MANAGED FISH PRODUCTION 525-0216

PAGE 2

| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | MEANS OF VERIFICATION | IMPORTANT ASSUMPTIONS |
|---|---|---|---|
| **Project Purpose:** | Conditions that will indicate purpose has been achieved: End of project status. | | Assumptions for achieving purpose: |
| To verify the need for and feasibility of a large scale managed fish production program | 1. Information required for the decision has been collected and analyzed.<br>2. Protein deficiencies are observed.<br>3. Fish production is cost efficient and within the budgetary constraints of most rural Panamanian families.<br>4. MIDA extension (technology transfer agents) can effectively disseminate information on fish production to Panamanian campesinos. | Project Studies | 1. Results of studies can be extrapolated to other areas of Pa nama. |

AID 1020-28 (7-71)
SUPPLEMENT I

# PROJECT DESIGN SUMMARY
## LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

PAGE 3

Project Title & Number: MANAGED FISH PRODUCTION 525-0216

| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | | | MEANS OF VERIFICATION | IMPORTANT ASSUMPTIONS |
|---|---|---|---|---|---|
| Outputs: | Magnitude of Outputs: Year 1 | Year 2 (Cumulative) | Year 3 | | Assumptions for achieving outputs: |
| 1. Demonstration Pond projects implemented | 5 | 20 | 20 | DINAAC and USAID/PANAMA records | 1. Grant and counterpart funds are made available on a timely basis. |
| 2. Hatchery expanded | | | | | 2. Construction costs will not evaluate more than 10-15% per year. |
| (a) Hatchery Ponds Built | 40 | 40 | 40 | | |
| (b) Laboratory equipped | | 1 | 1 | | 3. Adequate coordination is maintained between project studies team and regular DINAAC personnel including technology transfer agents. |
| 3. Project Studies completed | | | | | |
| (a) Consumption impact | | | 1 | | |
| (b) Economic/financial | | | 1 | | |
| (c) Program effectiveness | | | 1 | | |
| 4. Technical Assistance (Person-months technical assistance provided) | 16 | 30 | 48 | | |
| 5. Training (people trained) | | | | | |
| (a) In-country (short-term) | 9 | 32 | 32 | | |
| (b) External (long-term) | | 1 | 1 | | |
| 6. Technology transfer unit operational | x | x | x | | |

AID 1020-28 (7-71)
SUPPLEMENT I

# PROJECT DESIGN SUMMARY
## LOGICAL FRAMEWORK

Life of Project: From FY _____ to FY _____
Total U S. Funding _____
Date Prepared: _____

Project Title & Number: MANAGED FISH PRODUCTION 525-0216



| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | | | | MEANS OF VERIFICATION | IMPORTANT ASSUMPTIONS |
|---|---|---|---|---|---|---|
| Inputs: | Implementation Target (Type and Quantity) | | | | | Assumptions for providing inputs: |
| AID | Year 1 | Year 2 | Year 3 | Total | | |
| 1. Construction | | | | | | |
| a. demonstration ponds | 22,500 | 67,500 | 0 | 90,000 | | |
| b. hatchery ponds | 95,000 | 0 | 0 | 95,000 | | |
| 2. Equipment and materials | | | | | | |
| a. vehicles (8) | 98,000 | 0 | 0 | 98,000 | | |
| b. hatchery equipment | | 35,000 | | 35,000 | | |
| c. other | 14,000 | 13,000 | 14,000 | 51,000 | | |
| 3. Technical Assistance (48 p-m) | 137,500 | 184,000 | 90,500 | 412,000 | | |
| 4. Training | 6,000 | 27,000 | 20,000 | 53,000 | | |
| 5. Project Studies Personnel | 34,500 | 71,500 | 34,500 | 140.500 | | |
| 6. Other | 0 | 15,000 | 5,000 | 20,000 | | |
| GOP | | | | | | |
| 1. Construction | | | | | | |
| a. demonstration ponds | 5,000 | 15,000 | 0 | 20,000 | | |
| b. hatchery ponds | 75,000 | 0 | 0 | 75,000 | | |
| 2. Equipment and Materials | | | | | | |
| a. hatchery equipment | | 50,000 | | 50,000 | | |
| b. other | 5,000 | 11,500 | 8,500 | 24,000 | | |
| 3. Personnel | 51,000 | 148,000 | 97,000 | 286,000 | | |
| 4. Training | 3,000 | 3,000 | 4,000 | 10,000 | | |
| 5. Vehicle O & M | 32,000 | 56,000 | 42,000 | 130,000 | | |

# FINANCIAL ANALYSIS

This project consists of 7 major cost components: demonstration ponds, project studies, technology transfer center, training, technical assistance, hatchery expansion and operating expenditures. This section describes how various cost components were obtained.

## Cost Estimates

Cost estimates used in preparing the proposed budgets for the demonstration ponds, swine pen and hatchery expansion were based on information provided by DINAAC which has been compared for reasonableness to actual fish pond and swine pen costs accumulated by AID in the financing of 28 fish ponds and 3 swine pens with SDA funds over the last three years.

Detail costing of the construction of demonstration ponds, swine pens, credit fund and hatchery ponds follow.

## Demonstration Ponds

The construction of 20 demonstration ponds and 10 swine pens are contemplated under this project. All ponds will be machine dug and finished by manual labor. Although actual pond size will be determined during the selection phase of this project it is anticipated for budgetary purposes that ten 5,000 square meter ponds to be designated type A will be built, five 2,500 square meter ponds to be designated type B will be built and five 1,000 square meter ponds to be designated type C will be built. Ten swine pens will be built and integrated into the type A ponds.

The cost for a type A pond is as follows:

| | |
|---|---|
| Fixed Costs | |
| Materials for Drainage System | 235 |
| Variable Costs | |
| Excavation $1.00 per cubic meter | 5,000 |
| Fingerlings | 350 |
| Fish feed | 1,450 |
| Plastic bags for transportation | 8 |
| Chemical Fertilizer | 28 |
| Organic Fertilizer | 40 |
| Total Fish Pond Cost Type A | $ 7,111 |

Assuming variable cost are directly proportional to fish pond size. The cost of type B and type C ponds is respectively $3,673 and $1,610.

## Swine Pens

The cost of a swine pen of $954 per pen was calculated as follows:

| | |
|---|---|
| Concrete Blocks 550 at 27.00/100 | 148.50 |
| Sand 10 yds. at 6.50 per yd. | 65.00 |
| Gravel 8 yds. at 6.88 per yd. | 55.00 |
| Cement 60 sacks at 4.40 per sack | 264.00 |
| Zinc roofing 11 sheets 14X42 No. 30 at 18.00 | 198.00 |
| Nails 15 lbs. at .55 per pound | 8.25 |
| Roofing nails 10 lbs. at .75 per pound | 7.50 |
| 2X4X16 8 at 3.75 each | 30.00 |
| 1X8X10 4 at 2.50 each | 10.00 |
| Wire 5 lbs. | 2.25 |
| Contingencies | 166.00 |
| Total | $ 954.00 |

A summary of all activities to be financed as demonstration ponds follows:

| Type | Description | No. Units | Unit Cost | Total |
|---|---|---|---|---|
| A | 5,000 cubic meter pond | 10 | 7,111 | 71,110 |
| B | 2,500 cubic meter pond | 5 | 3,653 | 18,265 |
| C | 1,000 cubic meter pond | 5 | 1,610 | 8,050 |
| D | Swine pen | 10 | 954 | 9,540 |
| | Sub-Total | | | 106,965 |
| | Contingencies | | | 3,035 |
| | Grand Total | | | $ 111,000 |

## Credit Funds

The project proposal calls for a $30,000 credit fund $10,000 of grant funds and 20,000 of counterpart. This fund will be used to finance the start up cost of the 10 swine pens. Each loan will finance the following:

| | |
|---|---|
| Purchase of 25 weaned pigs at $38 each | 950 |
| 132 quintal of feed at 12.50 per quintal | 1,650 |
| Transportation of feed | 165 |
| Transportation of weaned pigs | 25 |
| Transportation of fattened pigs | 63 |
| Drugs | 125 |
| Total | $2,978 |

## Hatchery Expansion

$170,000 of project funds $95,000 AID and $75,000 GOP have been allocated for construction of 30 additional breeding ponds and a new laboratory at the Divisa Fish hatchery. Additionally, 85,000 of project funds (35,000 AID and 50,000 GOP) have been allocated for new hatchery equipment. A complete listing of equipment and its estimated cost can be found in Annex IV B. How the balance of funds to be used for construction has not yet been finalized but in no case will less than 30 new breeding ponds be built. The cost of breeding ponds in Divisa is significantly higher than the demonstration ponds because in Divisa it is not possible to take advantage of the local contours of the land to minimize costs.

## Other Costs

Cost estimates for the project studies, technology transfer center, training technical assistance and operating expense are based on overall USAID/Panama experience. As these cost are basically standard throughout the agency specific details are not presented in this project paper. Projected operating cost for ponds and swine pen are shown below:

OPERATING COSTS
Typical 5,000 Square Meter Pond

| | |
|---|---|
| Fingerlings 8,750 at $.04 each | 350 |
| Plastic bags for transportation | 8 |
| Fish food 100 quintals at 14.50 each | 1,450 |
| Chemical fertilizer 2 quintals 10-30-10 at 14.00 ea. | 28 |
| Organic fertilizer | 40 |
| Total | $1,876 |

OPERATING COST
SWINE PEN

| | |
|---|---|
| Weaned pigs 25 at $38 each | 950 |
| Feed 132 quintals at $12.50 per quintal | 1,650 |
| Transportation of feed | 165 |
| Transportation of pigs to and from market | 88 |
| Drugs | 125 |
| Total | $2,978 |

MANAGED FISH PRODUCTION
525-0216
PROJECTED EXPENDITURES BY FISCAL YEAR

| | FY 81 | | | FY 82 | | | FY 83 | | | TOTAL | | GRAND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AID | GOP | TOTAL | AID | GOP | TOTAL | AID | GOP | TOTAL | AID | GOP | TOTAL |
| **A. Demonstration Pond Projects** | | | | | | | | | | | | |
| 1. Materials and Equipment for Construction | - | - | - | 67,500 | 15,000 | 82,500 | 22,500 | 5,000 | 27,500 | 90,000 | 20,000 | 110,000 |
| 2. Credit Fund | - | - | - | 10,000 | 15,000 | 25,000 | - | 5,000 | 5,000 | 10,000 | 20,000 | 30,000 |
| 3. Diesel Pick-ups | 50,000 | - | 50,000 | - | - | - | - | - | - | 50,000 | - | 50,000 |
| 4. Extension Agents | - | 18,750 | 18,750 | - | 75,000 | 75,000 | - | 56,250 | 56,250 | - | 150,000 | 150,000 |
| 5. Local Labor | - | - | - | | | | | | | | | |
| **B. Project Studies** | | | | | | | | | | | | |
| 1. Sub-Project Director | 3,750 | - | 3,750 | 7,500 | - | 7,500 | 3,750 | - | 3,750 | 15,000 | - | 15,000 |
| 2. Sub-Project Director | 3,750 | - | 3,750 | 7,500 | - | 7,500 | 3,750 | - | 3,750 | 15,000 | - | 15,000 |
| 3. Data Analyst | 2,500 | - | 2,500 | 7,500 | - | 7,500 | 5,000 | - | 5,000 | 15,000 | - | 15,000 |
| 4. Field Supervisor | 4,500 | - | 4,500 | 9,000 | - | 9,000 | 4,500 | - | 4,500 | 18,000 | - | 18,000 |
| 5. Interviewers | 12,500 | - | 12,500 | 25,000 | - | 25,000 | 12,500 | - | 12,500 | 50,000 | - | 50,000 |
| 6. Perdiem for Interviewers | 7,500 | - | 7,500 | 15,000 | - | 15,000 | 7,500 | - | 7,500 | 30,000 | - | 30,000 |
| 7. Computer Analysis | - | - | - | 5,000 | - | 5,000 | 5,000 | - | 5,000 | 10,000 | - | 30,000 |
| 8. Equipment and Material | 5,000 | - | 5,000 | 5,000 | - | 5,000 | - | - | - | 10,000 | - | 10,000 |
| 9. Vehicle Purchase | 12,000 | - | 12,000 | - | - | - | - | - | - | 12,000 | - | 12,000 |
| **C. Technology Transfer** | | | | | | | | | | | | |
| 1. Materials Development | 9,000 | - | 9,000 | 18,000 | - | 18,000 | 9,000 | - | 9,000 | 36,000 | - | 36,000 |
| 2. Blazer Type vehicle | 12,000 | - | 12,000 | - | - | - | - | - | - | 12,000 | - | 12,000 |
| 3. Additional Staff | - | 12,200 | 12,200 | - | 24,400 | 24,400 | - | 18,400 | 18,400 | - | 55,000 | 55,000 |
| **D. Training** | | | | | | | | | | | | |
| 1. Long Term | 5,375 | 2,000 | 7,375 | 21,500 | - | 21,500 | 16,125 | - | 16,125 | 43,000 | 2,000 | 45,000 |
| 2. In-Country | 1,250 | 1,000 | 2,250 | 5,000 | 3,000 | 8,000 | 3,750 | 4,000 | 7,750 | 10,000 | 8,000 | 18,000 |
| **E. External Technical Assistance** | | | | | | | | | | | | |
| 1. Project Studies Coordinator | 56,250 | - | 56,250 | 81,750 | - | 81,750 | - | - | - | 138,000 | - | 138,000 |
| 2. Aquaculture Expert | 69,300 | - | 69,300 | 102,400 | - | 102,400 | 78,300 | - | 78,300 | 250,000 | - | 250,000 |
| 3. Short Term TA | 12,000 | - | 12,000 | - | - | - | 12,000 | - | 12,000 | 24,000 | - | 24,000 |
| 4. Utility Vehicle | 12,000 | - | 12,000 | - | - | - | - | - | - | 12,000 | - | 12,000 |
| **Sub-Total** | 278,675 | 33,950 | 312,625 | 387,650 | 132,400 | 520,050 | 183,675 | 88,650 | 272,325 | 850,000 | 255,000 | 1,105,000 |

MANAGED FISH PRODUCTION
525-0216
PROJECTED EXPENDITURES BY FISCAL YEAR

| | FY 81 | | | FY 82 | | | FY 83 | | | TOTALS | | GRAND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AID | GOP | TOTAL | AID | GOP | TOTAL | AID | GOP | TOTAL | AID | GOP | TOTAL |
| **F. Hatchery Expansion** | | | | | | | | | | | | |
| 1. Construction | 95,000 | 75,000 | 170,000 | - | - | - | - | - | | 95,000 | 75,000 | 170,000 |
| 2. Equipment | 35,000 | 50,000 | 85,000 | - | - | - | - | - | | 35,000 | 50,000 | 85,000 |
| 3. Diesel Pick-up | 12,000 | - | 12,000 | - | - | - | - | - | | 12,000 | - | 12,000 |
| 4. Additional Labor | - | 6,250 | 6,250 | - | 25,000 | 25,000 | - | 18,750 | 18,750 | - | 50,000 | 50,000 |
| **G. Operating Expenses** | | | | | | | | | | | | |
| 1. Vehicle Operation | - | 32,000 | 32,000 | - | 56,000 | 56,000 | - | 42,000 | 42,000 | - | 130,000 | 130,000 |
| 2. Office Material | - | 3,000 | 3,000 | - | 4,000 | 4,000 | - | 3,000 | 3,000 | - | 10,000 | 10,000 |
| 3. Incremental Hatchery Overhead | - | 1,875 | 1,875 | - | 7,500 | 7,500 | - | 5,625 | 5,625 | - | 15,000 | 15,000 |
| 4. Per Diem | - | 6,000 | 6,000 | - | 8,000 | 8,000 | - | 6,000 | 6,000 | - | 20,000 | 20,000 |
| 5. Staff Time | - | 7,800 | 7,800 | - | 15,600 | 15,600 | - | 11,600 | 11,600 | - | 35,000 | 35,000 |
| Total | 420,675 | 215,875 | 636,550 | 387,650 | 248,500 | 636,150 | 183,675 | 175,625 | 359,300 | 992,000 | 640,000 | 1,632,000 |

MANAGED FISH PRODUCTION
525-0216
Projected Flow of Grant Resources-Earmarkings

| | Total Development Grant Funds | 4th. Quarter FY 80 | 1st. Quarter FY 81 | 2nd. Quarter FY 81 | 3rd. Quarter FY 81 | 4th. Quarter FY 81 | 1st. Quarter FY 82 | 2nd. Quarter FY 82 | 3rd. Quarter FY 82 | 4th. Quarter FY 82 | 1st. Quarter FY 83 | 2nd. Quarter FY [illegible] | 3rd. Quarter FY 83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A. Demonstration Pond Projects | 150,000 | | | | | | | | | | | | |
| 1. Materials & Equipment for Construction | 90,000 | | | | | | 22,500 | 22,500 | 22,500 | 22,500 | | | |
| 2. Credit Fund | 10,000 | | | | | | 2,500 | 2,500 | 2,500 | 2,500 | | | |
| 3. Diesel Pick-Ups | 50,000 | | | | | 50,000 | | | | - | | | |
| 4. Extension Agents | - 0 - | | | | | | | | | | | | |
| 5. Local Labor | - 0 - | | | | | | | | | | | | |
| ^B. Project Studies | 175,000 | | | | | | | | | | | | |
| 1. Sub-Project Director | 15,000 | | | 7,500 | | | | 7,500 | | | | | |
| 2. Sub-Project Director | 15,000 | | | 7,500 | | | | 7,500 | | | | | |
| 3. Data Analyst | 15,000 | | | | 5,000 | | | | 5,000 | | | | 5,000 |
| * 4. Field Supervisor | 18,000 | | | 9,000 | | | | 9,000 | | | | | |
| * 5. Interviewers | 50,000 | | | | 25,000 | | | | 25,000 | | | | |
| 6. Driver | 0 | | | | | | | | | | | | |
| * 7. Per diem for Interviewers | 30,000 | | | | 15,000 | | | | 15,000 | | | | |
| 8. Computer Analysis | 10,000 | | | | | | | | 5,000 | | | | 5,000 |
| 9. Equipment and Material | 10,000 | | | | 5,000 | | | | 5,000 | | | | |
| 10. Vehicle Purchase | 12,000 | | | 12,000 | | | | | | | | | |
| * C. Technology Transfer | 48,000 | | | | | | | | | | | | |
| 1. Materials Development | 36,000 | | | | 18,000 | | | | 18,000 | | | | |
| 2. Blazer-Type Vehicle | 12,000 | | | | 12,000 | | | | | | | | |
| 3. Additional Staff | - 0 - | | | | | | | | | | | | |
| D. Training | 53,000 | | | | | | | | | | | | |
| 1. Long-Term U.S. | 43,000 | | | | | 21,500 | | | | 21,500 | | | |
| 2. In-Country Training | 10,000 | | | | | 5,000 | | | | 5,000 | | | |
| E. External Technical Assistance | 424,000 | | | | | | | | | | | | |
| 1. Project Studies Coordination | 138,000 | | | 93,000 | | | | 45,000 | | | | | |
| 2. Aquaculture Expert | 250,000 | | | 95,000 | | | | 155,000 | | | | | |
| 3. Short-Term T.A. | 24,000 | | | | 12,000 | | | | | | 12,000 | | |
| 4. Utility Vehicle | 12,000 | | | 12,000 | | | | | | | | | |

MANAGED FISH PRODUCTION
525-0216
Projected Flow of Grant Resources-Earmarkings

| | Total Development Grant Funds | 4th. Quarter FY 80 | 1st. Quarter FY 81 | 2nd. Quarter FY 81 | 3rd. Quarter FY 81 | 4th. Quarter FY 81 | 1st. Quarter FY 82 | 2nd. Quarter FY 82 | 3rd. Quarter FY 82 | 4th. Quarter FY 82 | 1st. Quarter FY 83 | 2nd. Quarter FY 83 | 3rd. Quarter FY 83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * F. Hatchery Expansion | 142,000 | | | | | | | | | | | | |
| 1. Construction | 95,000 | | | 95,000 | | | | | | | | | |
| 2. Equipment | 35,000 | | | | 35,000 | | | | | | | | |
| 3. Diesel Pick-Up | 12,000 | | | | 12,000 | | | | | | | | |
| 4. Additional Labor | - 0 - | | | | | | | | | | | | |
| G. Operating Expenses | - 0 - | | | | | | | | | | | | |
| 1. Vehicle Operation | - 0 - | | | | | | | | | | | | |
| 2. Office Materials | - 0 - | | | | | | | | | | | | |
| 3. Incremental Hatchery Overhead | - 0 - | | | | | | | | | | | | |
| 4. Per diem | - 0 - | | | | | | | | | | | | |
| 5. Staff Time | - 0 - | | | | | | | | | | | | |
| Total Project | 992,000 | - 0 - | - 0 - | 331,000 | 139,000 | 76,500 | 25,000 | 249,000 | 98,000 | 51,500 | 12,000 | - 0 - | 10,000 |

* Must begin within first year per PP

Recap. of Allotment Requirements

| | |
|---|---|
| FY 80 1/ | 100,000 |
| FY 81 1/ | 446,500 |
| FY 82 | 423,500 |
| FY 83 | 22,000 |
| | 992,000 |

1/ 100,000 of FY 81 needs, were allotted in FY 80.

MANAGED FISH PRODUCTION
525-0216
Projected Flow of Counterpart Resources - GOP

| | Total GOP Counterpart Funds | 4th. Quarter FY 80 | 1st. Quarter FY 81 | 2nd. Quarter FY 81 | 3rd. Quarter FY 81 | 4th. Quarter FY 81 | 1st. Quarter FY 82 | 2nd. Quarter FY 82 | 3rd. Quarter FY 82 | 4th. Quarter FY 82 | 1st. Quarter FY 83 | 2nd. Quarter FY 83 | 3rd. Quarter FY 83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A. Demonstration Pond Projects | 190,000 | | | | | | | | | | | | |
| 1. Materials and Equipment for Construction | 20,000 | | | | | | 5,000 | 5,000 | 5,000 | 5,000 | | | |
| 2. Credit Fund | 20,000 | | | | | | 5,000 | 5,000 | 5,000 | 5,000 | | | |
| 3. Diesel Pick-Ups | 150,000 | | | | | 18,750 | 18,750 | 18,750 | 18,750 | 18,750 | 18,750 | 18,750 | 18,750 |
| 4. Extension Agents | | | | | | | | | | | | | |
| 5. Local Labor | | | | | | | | | | | | | |
| B. Project Studies | - 0 - | | | | | | | | | | | | |
| 1. Sub-Project Director | - 0 - | | | | | | | | | | | | |
| 2. Sub-Project Director | - 0 - | | | | | | | | | | | | |
| 3. Data Analyst | - 0 - | | | | | | | | | | | | |
| 4. Field Supervisor | - 0 - | | | | | | | | | | | | |
| 5. Interviewers | - 0 - | | | | | | | | | | | | |
| 6. Driver | - 0 - | | | | | | | | | | | | |
| 7. Per Diem Interviewers | - 0 - | | | | | | | | | | | | |
| 8. Computer Analysis | - 0 - | | | | | | | | | | | | |
| 9. Equipment and Material | - 0 - | | | | | | | | | | | | |
| 10. Vehicle Purchase | - 0 - | | | | | | | | | | | | |
| C. Technology Transfer | 55,000 | | | | | | | | | | | | |
| 1. Materials Development | - 0 - | | | | | | | | | | | | |
| 2. Blazer-type Vehicle | - 0 - | | | | | | | | | | | | |
| 3. Additional Staff | 55,000 | | | | 6,100 | 6,100 | 6,100 | 6,100 | 6,100 | 6,100 | 6,100 | 6,100 | 6,200 |
| D. Training | 10,000 | | | | | | | | | | | | |
| 1. Long-Term | 2,000 | | | | | 2,000 | | | | | | | |
| 2. In-Country | 8,000 | | | | | 4,000 | | | | 4,000 | | | |
| E. External Technical Assistance | - 0 - | | | | | | | | | | | | |
| 1. Project Studies Coordination | - 0 - | | | | | | | | | | | | |
| 2. Aquaculture Expert | - 0 - | | | | | | | | | | | | |
| 3. Short Term TA | - 0 - | | | | | | | | | | | | |
| 4. Utility Vehicle | - 0 - | | | | | | | | | | | | |

MANAGED FISH PRODUCTION
525-0216
Projected Flow of Counterpart Resources - GOP

| | Total GOP Counterpart Funds | 4th. Quarter FY 80 | 1st. Quarter FY 81 | 2nd. Quarter FY 81 | 3rd. Quarter FY 81 | 4th. Quarter FY 81 | 1st. Quarter FY 82 | 2nd. Quarter FY 82 | 3rd. Quarter FY 82 | 4th. Quarter FY 82 | 1st. Quarter FY 83 | 2nd. Quarter FY 83 | 3rd. Quarter FY 83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F. Hatchery Expansion | 175,000 | | | | | | | | | | | | |
| 1. Construction | 75,000 | | | 75,000 | | | | | | | | | |
| 2. Equipment | 50,000 | | | | 50,000 | | | | | | | | |
| 3. Diesel pick-up | | | | | | | | | | | | | |
| 4. Additional Labor | 50,000 | | | | | 6,250 | 6,250 | 6,250 | 6,250 | 6,250 | 6,250 | 6,250 | 6,250 |
| G. Operating Expenses | 210,000 | | | | | | | | | | | | |
| 1. Vehicle Operation | 130,000 | | | 4,000 | 14,000 | 14,000 | 14,000 | 14,000 | 14,000 | 14,000 | 14,000 | 14,000 | 14,000 |
| 2. Office Materials | 10,000 | | | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| 3. Incremental Hatchery Overhead | 15,000 | | | | | 1,875 | 1,875 | 1,875 | 1,875 | 1,875 | 1,875 | 1,875 | 1,875 |
| 4. Per diem | 20,000 | | | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| 5. Planing Office Chief | 35,000 | | | | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,800 |
| Total Project | 640,000 | | | 82,000 | 77,000 | 59,875 | 63,875 | 63,875 | 63,875 | 67,875 | 53,875 | 53,875 | 53,875 |

Recap. of GOP Contribution
by Calender Year

| | |
|---|---|
| 1980 1/ | 100,000 |
| 1981 1/ | 182,750 |
| 1982 | 249,500 |
| 1983 | 107,750 |
| | 640,000 |

1/ 100,000 of CY 81 needs included in CY 80 approved budget.

Time-Phased

Implementation Plan

| Activity | Year (CY) | 1980 | | 1981 | | | | 1982 | | | | 1983 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quarter | 3 | 4 | 1 | 2 | 3 | 4 | 2 | 3 | 4 | | 1 | 2 | 3 |
| A. Project Benchmarks (Monitoring) | | | | | | | | | | | | | | |
| 1. Signature Grant Agreement | | x | | | | | | | | | | | | |
| 2. Conditions Precedent 4.1 | | | | | | | | | | | | | | |
| a. Legal Opinion | | x | | | | | | | | | | | | |
| b. Authorized Signature | | x | | | | | | | | | | | | |
| 3. Conditions Precedent 4.2 | | | | | | | | | | | | | | |
| a. L.T. T.A. | | | | x | | | | | | | | | | |
| b. Annual Plan | | | | x | | | | | | | | | | |
| c. Increased Staff | | | | x | | | | | | | | | | |
| 4. Evaluations | | | | | | x | | | x | | | | x | |
| 5. PACD | | | | | | | | | | | | | x | |

| Activity | Year (CY) | 1980 | | 1981 | | | | 1982 | | | | 1983 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quarter | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| **B. Project Activities** | | | | | | | | | | | | | | |
| **1. Demonstration Ponds** | | | | | | | | | | | | | | |
| 1. Site Selection | | | | x | x | | | | | | | | | |
| 2. Pond Construction initiated ($7,500 c.u.) | | | | | | | 5 | 5 | 5 | 5 | | | | |
| 3. Pickups Purchased ($12,500 c.u.) | | | | | | 4 | | | | | | | | |
| 4. Credit Fund ($10,000) established | | | | | | x | | | | | | | | |
| 5. Additional Extension Agents hired | | | | | | 8 | | | | | | | | |
| **2. Project Studies** | | | | | | | | | | | | | | |
| 1. CIS sub-project Director hired (1/2 time-$5000/year) | | | | x | | | | | | | | | | |
| 2. E/F sub-project Director hired (1/2 time-$5000/year) | | | | x | | | | | | | | | | |
| 3. Data Analyst (as needed) | | | | x | | | | | | x | | | | x |
| 4. Field Supervisor hired | | | | | x | | | | | | | | | |
| 5. Interviewers hired | | | | | | x | | | | | | | | |
| 6. Chauffeur hired | | | | | | x | x | x | x | x | x | x | x | |
| 7. Field Studies | | | | | | | | | | x | | | | x |
| 8. Computer Analysis | | | | | | | | | | | | | | |
| 9. Vehicle Purchased | | | | x | | | | | | | | | | |

| Activity | Year(CY) | 1980 | | 1981 | | | | 1982 | | | | 1983 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quarter | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 |
| 3. Technology Transfer | | | | | | | | | | | | | | |
| 1. Development and Dissemination of Materials | | | | | | x | x | x | x | x | x | x | x | |
| 2. Vehicle Purchased | | | | | | x | | | | | | | | |
| 3. Additional Personnel | | | | | 2 | | | | | | | | | |
| 4. Training | | | | | | | | | | | | | | |
| 1. Long-term U.S. (1 person) | | | | | | | x | x | x | x | x | x | x | x |
| 2. In-Country | | | | | | x | x | x | x | x | x | x | x | |
| 5. External Technical Assistance | | | | | | | | | | | | | | |
| 1. Social Scientist Contracted (1/2 time for life of project | | | | x | | | | | | | | | | |
| 2. Aquaculturist Contracted (30 p-m) | | | | x | | | | | | | | | | |
| 3. External T.A. | | | | x | | | | | | | | | | |
| 6. Hatchery Expansion | | | | | | | | | | | | | | |
| 1. Pond Excavation | | | | x | x | x | | | | | | | | |
| 2. Equipment Purchase | | | | | x | | | | | | | | | |
| 3. Vehicle Purchase | | | | | | x | | | | | | | | |
| 4. Additional Workers Hired | | | | | | x | | | | | | | | |

# Detailed Hatchery

## Equipment List

| ITEM | COST ($) |
|---|---|
| **AID Financed** | |
| 1 Diesel pump 8"; 8,000 gl/min 30 ft. lift, 50 HP | 18,500 |
| 1 Diesel generator 5000 watts | 5,400 |
| 1 refrigerator 14 $ft^3$ | 800 |
| 2 air conditioners | 1,400 |
| 1 small tractor with grass cutting attachments | 5,000 |
| 1 Otterbine aerator, 2 HP | 1,000 |
| 5 YSI dissolved oxygen meters | 2,900 |
| | 35,0[illegible] |
| **GOP Financed** | |
| Seines and nets | 13,000 |
| Analytical Chemicals | 700 |
| 5 YSI combination probes (140.00 each) | 700 |
| 5 YSI cables, 10 ft. | 300 |
| 5 calibration chambers | 500 |
| Laboratory glassware | 3,000 |
| Dissecting microscope with light source | 1,000 |
| 35 mm camera with accessories (28 x 110 mm lens) | 800 |
| 5 fish transport tanks, 275 gal fiberglass (600) | 3,000 |
| 5 Submergible pumps 2,500 gal/hr or 5 ft head (90.00 ea.) | 450 |

GOP Financed

| | |
|---|---|
| 8 Chatillon hanging scales 60 lb. x 1 Oz. | 850 |
| 2 Dietary scales, 500 g x 2 g | 100 |
| 24 Pocket thermometer-C° | 100 |
| 1 Photocopying machine | 3,000 |
| Miscellaneous supplies | 5,000 |
| 5 Max-Min thermometer - C°-45° to 50° (10.00 ea.) | 100 |
| pH paper comparator Kit, 0-14pH | 50 |
| 20 pH paper strips, 0-14pH | 50 |
| 20 pH paper strips, 6-9.5pH | 50 |
| Contingencies | 16,150 |
| | $ 50,000 |

# PRELIMINARY WORKSCOPE FOR PROJECT STUDIES FOR MANAGED FISH PRODUCTION PROJECT

## A. Research Objectives

The overriding question is: do continuous-harvest village fish ponds, with increments of animal production, horticulture, and forage production, represent the most cost-effective means of increasing protein and caloric intake among the nutritionally at-risk segments of Panama's village population?

Simultaneous research (see research strategy section below) will be carried out on three levels: the household level, the project level, and the community level. The principal research questions addressed at each level are are follows:

1) The household level.

a) Do fishponds, related animal production, related horticulture, and related forage production, incrementally or as a system, improve household nutritional levels, as measured by total household protein consumption and increased dietary variety (additional or in substitution)?

- in what degree,
- at what cost, and
- assuming benefit, who benefits most within the household group?

b) What household characteristics correlate with or affect positive or negative outcomes?

c) Which households benefit and why?

d) Are households having the poorest diets reached?

2) The community level.

a) See 1 b, c, and d above.

b) What community characteristics correlated with or affect positive or negative outcomes?

3) The project level.

a) Should/can the project be extended to other communities and to what type? Partially or wholly? Which components in which combination?

b) Is total pond output relative to village size adequate to effect a meaningful household-level dietary change?

c) Is the output (fish or animal protein, vegetables, cash, which is distributed to coop members adequate to effect a change?

d) Is there an identifiable difference in effect among non-members and members?

e) How much of the new production is sold and how much consumed?

f) What is the relative effectiveness of alternative types of linkages between MIDA/DINAAC and community interest groups?

g) What are the costs and benefits to project members, communities, and households?

3. Important disaggregations, aggregations, and correlations (appropriate statistical tools to be decided once sample size and field research frequency are determined, and universe of final data outputs is circumscribed)

By number and sequencing of project expansion and expansion increments.

By different administrative/Management arrangements.

By community type.

By aggregate household characteristics/by disaggregated household characteristics.

By seasonal effect.

C. Research Strategy

The overall research strategy derives largely from Option D (see Annex X ), in accordance with the Nutrition Economics Group recommendations; this writer's own perceptions of research needs and possibilities, as well as potential research economies; and with consensus determined through conversations with interested parties.

The total activity will consist of a baseline research activity at the household, project, and community levels, with subsequent revisits to examine a smaller data universe. The revisits will be phased to permit project effect to occur; the baseline activity will be timed to precede any interventions on selected demonstration sites for which the principal selection criteria will be that they are fish-only ponds currently being periodically harvested.

The household level.

a) Sample size. Entire community. According to recent USAID preliminary appraisal of universe of potential demonstration sites, modal community size is from 35-40 households; the few that are larger (defined as over 100 households) could be sampled, using customary random selection techniques based on preliminary mapping, with no sample under 40 households, or could simply be treated by interviewing half of all household (i.e., every other house. Final decision on sampling will be made in conjunction with final demonstration site selection.

There will be from 15 to 20 communities which will be demonstration sites; the preliminary rough research design is based on a hoped-for N of 20.

b) Timing. Development of demonstration sites is to be phased, 10 during year 1 and 10 during year 2. There are clearcut income/nutrition peaks and lows in the project area -- June through August = period of low income, low food availability, and high food expenditures; January through March = period of higher income, greater food availability, and corollarily lower food expenditures -- and timing of site selection, baseline data-gathering, monitoring activity, and end-of-project impact assessment will have to be carefully crafted to account for these crucial variations. There is some margin at the edges of these peak and low periods in Veraguas Province where a large number of the demonstration ponds may be set up (see Figure I below) which will allow a certain flexibility in the research timing; it is clear, though, that low-period

analysis can be completed no later than the end of August and peak-period analysis no later than the end of March. There are other variables that will also have to be incorporated into research planning, principally regional rainfall patterns and presence or absence of a second harvest (postrera). Both of these factors will influence income and food availability patterns, community labor resources, site accessibility, and technological considerations (e.g., tractor use, planting, maintenance, etc.).

Also to be taken into account are: (1) identification, training, and siting of agronomists responsible for demonstration ponds (minimum number of agents, 4; maximum 8; 1 to 2 per MIDA region. If 4, each agent will be responsible for 5 demonstration ponds);

(2) time for site selection

(3) time for instrument pre-testing/supervisor and interviewer/coder training

(4) time needed for baseline studies

(5) time needed to bring pond up from refill/stocking to production (i.e., time when harvesting may begin without prejudicing pond success, estimated at 3 months).

Should funding be available for the current calendar year, the project could begin in November, a month which could be used to address administrative and contractual issues. December in Panama, as elsewhere in Latin America, is a month in which bureaucratic and community interests are focused elsewhere, but contractual explorations begun in November could be cemented during this period, as might site selection.

c) One vehicle, one field supervisor, and 4 trained interviewer/coders in two teams (A/Monday and B/Tuesday) will carry out the baseline studies as follows: during the first 2 days (e.g., Monday and Tuesday), each interviewer will do 5 household interviews per day for a total of 40 (20 per team) which will include the basic and economic data, community and project experience, and 24-hour dietary recall. The third day is used for verification and correction of these interviews. The fourth day is used for a repeat of the dietary recall section by the same

interviewers with the same households (estimated interview time 30 minutes, 10 interviews per team member). The fifth day is for verification and correction of the second dietary recall and for travel.

If a six-day work week is adopted, each household could be visited in the course of the survey week. The field supervisor will, in any case, supervise interviewers (intensively at first, with spot checks later) and do project-level and community-level interviewing.

d) Data to be collected:

- Basic household data (name, ages, relationships/civil statuses, education, type of residential grouping, housing type)

Adult females only (heads of household?, No. of pregnancies, No. of live births, No. of living children, pregnant), or simply limit to number of pregnant and lactating woman in the household group.

- Project relationships and experience: individuals in household involved in fish and project (numbers, roles, division of labor); nature of ties to other participants in fish and activities (family, extended family, community)

- Economic data: number of items produced on-farm; proportions sold, proportions consumed in household; price received per unit sold/where:

number of subsistence items purchased;
land tenure (dominant modality, number or;
parcels, estimated size in mz.)

- Dietary date (24-hour recall):

persons present at meals of preceding day;
what eaten day before and by whom;
what food purchases made preceding day;
what food sales made preceding day;
what food gifts received/given preceding day
amounts of product from project a) consumed,
sold, given away by household

relative valuing of different project components

(See McGuire 1979 for suggestions on approaches, unit breakdowns, etc.). Note that impact will be measured as:

(1) Change in protein intake per consumption unit
(2) Increments to dietary diversity by item, frequency, amount of main dietary components before, during, and after project.

The community level.

a) Descriptive data.

- Number of household, total population
- Settlement patterns
- Access (distance/location) to public services and off-farm employment
- Access to markets for buying and selling, market patterns (e.g., fixed or random)
- Origins and prices of subsistence foods (local market or tienda check)
- Fixed factors affecting production, diet, general well-being (e.g., altitude, temperature)
- Unit measures/currency/prices per unit
- Credit availability, mechanisms, terms

b) Community organization and project experience.

- Number of community organizations or action groups in existence (2-year time depth?)
- Overlap with fish and project group
- Experience with community activities prior to project (type, duration)
- Prior experience (collective or individual) with credit
- Presence of service entities/outreach workers
- Experience with non-formal training (could also be addressed at household level)

The project level.

a) Project organization.

- Number of members, % of households represented
- Sex ratios in membership
- Composition of leadership (age, sex, other leadership roles in community)
- Origins of project (spontaneous, promoted, imposed)

b) Project dimensions, problems, and achievements (technical and economic)

- pond area ($m^2$)
- hard/flock size; no. of fish stocked, types, stocking frequency
- land in production (mz.), joint or individual-parcel design, marketing organization
- yields per project component per unit per month, season, year (calculate ratio to realistic optimum and/or project targets)
- harvest (maturation time, frequency)
- crop or hard/flock losses (dimensions, causes)
- distribution modalities for each component (sale, gift, exchange, to whom, in what proportions, with what frequency, how, selling prices, division of income, profits or absorption of losses
- perceptions of relative costs and benefits (to individuals, community, and project members)
- division of labor/person-hours/tasks
- proportion of community affected/involved/how
- technical assessment of project achievements and problems (e.g., yields per variety, maturation times, input quantities and timing, community technological and management capacity)
- quantities of inputs (link to costs)

c) Economic aspects.

- costs (to community, membership)
- credit (interest, collateral, terms, purpose)
- labor (adjusted values for family, hired, donated labor/% of market price for labor); note if food received for labor and calculate imputed value)
- tractor costs (in cash and/or labor)

- inputs (fingerlings, fish feed, pets, contruction materials, seed, fertilizer, piglets, pullets, ducklings, transportation of inputs, service fees if any)
- marketing costs (impute cost of all foregoing which are donated)
- project and administrative costs (capital costs) (note changes and control for inflation, overall salary adjustments, etc.)

d) Project management and implementation issues.

- frequency/satisfactoriness of contact with institutional personnel (DINAAC/MIDA/MSP etc.), especially outreach personnel and extension agents
- existence/client awareness of project schedule for agent visits, input delivery, marketing
- client understanding of outreach agent's role content, responsibilities, and "added attractions"
- services provided and by whom (e.g., credit, inputs, technical assistance, credit collection, marketing, record-keeping)
- costs of services (service fees, inputs, interest, marketing)
- perceptions of quality/appropriateness/timing of each service and capability of service deliverer
- perceptions of an attitudes toward institutional dependency
- changes in institutional relationships (which, why, when)
- numbers, ages, sex of recipients, frequency and duration of project-related non-formal training (e.g., aquaculture, pig-raising, horticulture, simple financial management, credit and coop management)
- client account of training content
- client perceptions of adequacy of training (ranking of components, sense of their adequacy)
- sense of project control (who runs project, using indicators such as record-keeping and project members' knowledge of and access to records, production, costs and benefits, etc.)

- presence of paraprofessionals (salaried/unsalaried), perceived effectiveness, quality of community and institutional relationships (use scaling devices)
- inter and intra-institutional relationships: frequency and consent of contact, communication mechanisms
- logistical problems (e.g., vehicles, procurement, communications, space, equipment, support services)
- utilization and comprehension of guides and standards, training and promotional materials
- functioning of reporting and record-keeping system.

As indicated earlier, the village-level and project-level interviews will be carried out by the field supervisor. The village-level data will be gathered through observation and interviews with community leaders. The project-level interviews will be carried out with: the DINAAC agent and DINAAC regional backstop, the fishpong project leadership, paraprofessionals and other institutional representatives, and a small, non-random subsample of households.

Finally, all the data listed above for the baseline activity need not, obviously, be gathered in the revisits or even in the EOP impact assessment. The whittling down of the data universe for those activities can occur as part of the PP activity or as part of the actual research design activity at the front end of the project.

FIGURE 1. AGRICULTURAL CYCLE/SEASONAL FACTORS IN NUTRITION, PROVINCE OF VERAGUAS 1/

| | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rain<br>R = Rainy | | | | | R | R | R | R | R | R | | |
| Food Availability<br>A = Abundance<br>S = Scarcity | A | A | | | | S | S | S | | A | A | A |
| Off-Farm Labor<br>P = Primary Act. (cane harvest)<br>I = Intermittent (work in ingenio)<br>(I)= Harvest | P | P | P | | I | I | | | | | | (I) |
| Morbidity Peaks<br>G = Gastroenteritic Disease<br>R = Respiratory Infections | | | | | G | | | | | | R | |
| Corn<br>P = Plant<br>H = Harvest | H | | | | P | | | | H<br>P | | | |
| Rice<br>P = Plant<br>H = Harvest<br>(H)= Some harvest, depending on season and area | | | | P | | | | | H | (H) | | |
| Beans (frijol de bejuco) | H | | | | | | | | | P | | |
| Beans (poroto) | H | | | | | | | | | | P | |
| Pigeon peas (Guandú) | H | | | P | P | | | | | | | |
| Tubers (e.g. otoe, yuca, ñame) (can be harvested year-round through must be consumed within 2 mos. of removal from ground) | H | | | P | | | | | | | | |
| Summary: On-Farm and Off-Farm Agricultural Activity | Wage labor on sugar harvest, with some returns to own land for planting preparation. Peak of cash income for many. | | | Planting rice, corn, tubers, guandu. Transitional period in terms of well-being. | | Cultivation, weeding of planting (tiempo en casa) some off-farm labor for cash or exchange. Peak of food scarcity-labor inactivity. | | | Harvest on-farm corn and rice. Planting beans, 2nd corn crop (postrera) | | Months of relative well-being and inactivity. | |

3/ The purpose of this activity will be to assess the appropriateness and trustworthiness of the data gathering strategy and protocols. Since form, style, and methodology are under scrutiny and data are not per se important, pretesting will be carried on in communities where DINAAC/MIDA has already helped with some sort of fishpond improvement expansion, or elaboration. The reasons are ethical and practical: pretesting in a demonstration community would obviously bias subsequent research; pretesting in a fishpond community where no intervention was planned could awaken expectations which could be unfulfilled.

2/ All research planning and implementation will be, carried out in collaborative fashion between the project supervisor and the field supervisor. As the research team is formed, they, too will be involved in collaborative activity.

1/ Sources: McGuire, 1979; 12 and PHarrison, 1978: 19.

FIGURE 2. PROJECT RESEARCH CYCLE (TENTATIVE), MANAGED FISH PRODUCTION FEASIBILITY STUDIES, USAID/PANAMA

| | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year I (1981) | training extensionist who will manage etc. demonstration ponds<br><br>selection 10 demonstration sites<br><br>hiring Panamanian field research team supervisor<br><br>refinement of data universe<br><br>preparation field instruments including decisions on coding categories, possible output tables, etc.<br><br>pretesting field protocols<br><br>consultancy with data analyst | | | hiring research team<br><br>design/plan training of research team<br><br>team training<br><br>final pretest of field protocols<br><br>final design protocols, reproduction | | baseline data-gathering in 10 project sites (time estimates based on total of one 6-day week in each of 10 sites, 4 interviews and 24 hr. dietary recalls and field research supervisor doing project and community interviews) (see supra for tentative details of both activities) | | | interviewers will be trained and will perform the following tasks:<br><br>- calculations on forms (e.g., consumption units)<br><br>- encoding of form and rechecking codes<br><br>- sending cards to be punched | | interviewers, coders will verify punched data<br><br>computer programming and data analysis<br><br>selection 2nd group of 10 demonstration sites | writing of baseline report<br><br>feedback to DINAAC, USAID, MIDA, discussion |
| Year II (1982) | baseline data-gathering in 10 new demonstration sites as before<br><br>(could repeat dietary recall, selected research components in 1st 10 sites) | | | same activities as Sept-Dec 1981; reduced time frame attributable to experience, prior programming, etc. | | refinement of baseline instruments to capture change; data universe will be reduced<br><br>re-interviews, first 10 demonstration sites (or in 2nd 10 demonstration sites) | | | cleaning, coding, processing; analysis, writeup of revisit data of 1st 10 sites | | series of work sessions among research team, DINAAC leadership and personnel to address first findings on project impact, problems, etc. | |

Alternatives (depending on project phasing and available funds):

A (maximum):

2 baseline visits to each group of 10 demonstration sites - 1st group June-Aug. 1981 second group Jan - March 1982

3 revisits at 6-month intervals to 1st 10 demonstration sites (Jan-Mar 1982, June-Aug. 1982, and Jan-March 1983).

1 EOP evaluation at 1 year - 18 months of all 20 demonstration sites, June-Aug 1983 or Jan-March 1984 depending on project timing.

B (minimum);

2 baseline visits as above (June-Aug 1981 and Jan-March 1982)

2 revisits to 1st 10 demonstration sites, June-Aug 1982 and Jan March 1983 (1 yr and 6 months intervals)

| | | | | | |
|---|---|---|---|---|---|
| Year III (1983) | re-interviews for 2nd 10 demonstration sites<br><br>( - could repeat dietary recall selected research components in 1st 10 sites) | cleaning, coding, processing, analysis of revisit data on 2nd sites | writeup of overall findings, analysis, recommendations<br><br>feedback to DINAAC etc., by team<br><br>discussion<br><br>decision on future AID project involvement<br><br>implication for other fish production activities | margin for the Law of Murphy<br><br>EOP | Options for final evaluation - long term follow-up at 1 to 18 months after revisit to 2nd group of demonstration sites (all 20 sites to be revisited)<br><br>- revisits to 1st group of demonstration sites only, June-Aug 1983 or Jan-March 1984 |

# PRELIMINARY SCOPE OF WORK FOR THE ECONOMIC/FINANCIAL ANALYSIS TO BE CONDUCTED UNDER THE PROJECT

With the information available from the survey discussed in Annex V.A and from other data sources, as may be required, the following two types of analyses will be developed: (1) a financial cash flow analysis for each fish pond system in order to ascertain the financial viability of the operation, from the point of view of the total system and that of each of the participating families as well. By fish pond system is meant the fish pond itself and any activities associated or integrated with it such as swine or chickens which provide the fish food; and (2) economic feasibility analyses for each of the fish pond systems. To the extent possible, the contractor will make the usual adjustments in the market prices of the various inputs as well as outputs to reflect economic prices: For the volunteer labor provided by the participating families, this implies estimating the opportunity cost of the time spent work on the fish pond activities; for the fingerling costs, this implies the need to obtain data on the cost of operating the fish hatchery, and, for technical assistance provided by DINAAC and others, this implies estimating the value of time spent working with each fish pond system.

As part of the analysis, the following also will be determined or estimated: fish consumption by the group of participating families, and by people outside the group; pilferage and losses; price - quantity relationships, in an attempt to obtain a rough average demand schedule so that a pricing policy might be established; the increase in protein consumption and the substitution that occurs; and financial and economic costs of traditional alternative protein sources.

Results of the preliminary economic/financial analysis carried out as part of the project design process are presented in the following tables which also serve as models for the detailed economic/financial analysis to be carried out as part of the project.

DEMONSTRATION POND MODEL
SWINE FATTENING: Annual Sales and Expenditures
(25 hogs per cycle, two cycles per year)

| | | | YEAR 1 | | YEAR 2 | YEAR 3-5 |
|---|---|---|---|---|---|---|
| Sales | Unit price | Number | Cycle 1 | Cycle 2 | | |
| Hogs 1/ | $130 | 25 | 3,250 | 3,250 | 6,500 | 6,500 |
| **Investment** | | | | | | |
| Infrastructure 2/ (materials | | | (600) | --- | --- | --- |
| Equipment | | | (100) | --- | --- | --- |
| **Operating Expenditures** | | | | | | |
| Weener hogs | 38 | 25 | 950 | 950 | 1,900 | 1,900 |
| Feed 3/ | 12.50/qq | 132/qq | 1,650 | 1,650 | 3,300 | 3,300 |
| Transport feed | 1.25 | 132 | 165 | 165 | 330 | 330 |
| Transport hogs 4/ | 3.50 | 25 | 88 | 88 | 176 | 176 |
| Drugs | 5.00 | 25 | 125 | 125 | 250 | 250 |
| Sub-total | | | 2,978 | 2,978 | 5,956 | 5,056 |
| Interest (5%) | | | 147 | 147 | 294 | 294 |
| Total Op. Exp. 5/ | | | 3,125 | 3,125 | 6,250 | 6,250 |
| **Total Expenditures** | | | 3,125 | 3,125 | 6,250 | 6,250 |
| **Ending Balance** | | | 125 | 125 | 250 | 250 |

1/ 150 lbs. each at $.875/lb on hoof
2/ $600 for cement and roofing financed by Project and local materials at no charge.
3/ About 1/4 of feed requirement is obtained from locally available feed stuffs at no charge.
4/ Transport of weener pig $1.00/head, fattened pig $2.50/head.
5/ Labor is excluded since work is shared among many partners at virtually zero opportunity cost to each individual.

DEMONSTRATION POND MODEL, Cont.
FISH RAISING 1/

| Inflow | YEAR 1 | YEAR 2-4 | YEAR 5 |
|---|---|---|---|
| Sales 2/ ($.40/lb X 1000 lbs.) | 400 | 400 | 400 |
| Home Consumption 3/ (.15/lb. X 4000 lbs.) | 600 | 600 | 600 |
| Total: | 1,000 | 1,000 | 1,000 |
| **Investment: 4/** | | | |
| Pond Construction | (7,500) | -- | -- |
| Seine | ( 200) | -- | 200 |
| **Operating Expenditures** | | | |
| Fish (5,000 fingerlings $.04) | 200 | 200 | 200 |
| Fertilizer (at stocking) | 50 | 50 | 50 |
| Transport (stocking, once each 12 mo.) | 40 | 40 | 40 |
| Misc. and Interest on Op. Exp. | 60 | | 60 |
| **Total Expenditures** | 350 | | 550 |
| **Ending Balance** | 650 | | 450 |

1/ In a 5,000 $m^2$ pond fertilized by waste from a swine operation. After a three-month grow out period, fish are harvested weekly for 12 moths, the pond is restocked with (tilapia nilotica)

2/ Assuming that during the 12-month cycle approximately 20 percent of the harvest is sold to families in the vicinity of the pond.

3/ Assuming 20 families participated, and a minimum of 5 pound/family over the 9 months of actual harvest.

4/ Grant financed.

DEMONSTRATION POND MODEL

Consolidated Budget: Swine Fattening and Fish Raising, Project Cash Flow

| Inflow | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5-10 |
|---|---|---|---|---|---|
| Swine Sales | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 |
| Fish Sales | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Production Credit Loans | | | | | |
| Swine | 5,956 | 4,956 1/ | 3,956 | 1,956 | -- |
| Fish | 335 | -- | -- | -- | -- |
| Own working capital 2/ | -- | 1,000 | 2,000 | 4,000 | 5,956 |
| TOTAL | 13,791 | 13,456 | 13,456 | 13,456 | 13,456 |
| **Outflow** | | | | | |
| Operating Expenditures | | | | | |
| Swine | 5,956 | 5,956 | 5,956 | 5,956 | 5,956 |
| Fish | 335 | 335 | 335 | 335 | 335 |
| Production Credit Repayment | | | | | |
| Swine | 6,250 | 5,204 | 4,155 | 2,055 | -- |
| Fish | 350 | -- | -- | -- | -- |
| TOTAL | 12,891 | 11,495 | 10,446 | 8,346 | 6,291 |
| Cash Surplus (apparent) | 900 | 1,961 | 3,010 | 5,110 | 7,165 |
| Actual Annual Surplus | 900 | 961 | 1,010 | 1,110 | 1,209 |
| Cumulative Surplus 3/ | 900 | 1,861 | 2,871 | 3,981 | 5,190 |

1/ As of year 2, part of the previous end-of-year cash surplus is applied toward the working capital requirement of the swine operation, hence the amount of production credit declines until the loan is eliminated. NOTE: 2,978 of production credit is needed per cycle in year 1, 2478 per cycle in year 2 1978 per cycle in year 3, $978 in year 4 and 0 in year 5.

2/ Actual amount of own working capital is one-half the figures shown.

3/ Including the cash surplus that is applied annually to the working capital requirement as of year 2.

ANNEX V.B.
Table II

DEMONSTRATION POND MODEL
ECONOMIC RETURN
INCLUDING OPERATING AND POND CONSTRUCTION COSTS

| YEAR | OPERATING EXPENDITURES Swine | Fish | Labor | INVESTMENT 1/ Swine | Fish | Total Expenditures | Total Income | Income Less Expenditures | 10% Discount Factor | Present Value |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6,250 | 350 | 400 | 1,000 | 7,700 | 15,700 | 7,500 | (8,200) | .9090 | (7,454) |
| 2 | 6,250 | 350 | 400 | -- | -- | 7,000 | 7,500 | 500 | .8264 | 413 |
| 3 | | | | | | | 7,500 | 500 | .7513 | 376 |
| 4 | | | | | | | 7,500 | 500 | .6830 | 342 |
| 5 | | | | | | | | 500 | .6209 | 310 |
| 6 | | | | | | | | 500 | .5645 | 282 |
| 7 | | | | | | | | 500 | .5132 | 257 |
| 8 | | | | | | | | 500 | .4665 | 233 |
| 9 | | | | | | | | 500 | .4241 | 212 |
| 10 | | | | | | | | 500 | .3855 | 193 |
| | | | | | | | | | | (4,836) 3 |

1/ Investment includes labor: $400, Swine and 200 Fish
2/ Labor: Swine 1/2 day X 150 days X 2 cycles X $2.00/day
Fish 1 day/wk X 50 wks X 2.00
3/ Charging an additional 16¢ per pound would provide an additional $787 per year which in turn would give an IRR of 10%. The resulting price of fish for participants and non-participants would be $0.31¢ and 56¢ respectively.

ANNEX V.B.
Table III

## ALTERNATIVE FISHPOND MODEL[1/]

| INCOME[2/] | ANNUAL SALES AND EXPENDITURES YEAR 1 |
|---|---|
| Sales (at 40¢/lb. X 8,000 lbs. | $ 3,200 |
| Home Consumption (at 15¢/lb. X 4,000 lbs.) | 600 |
| TOTAL | $ 3,800 |
| Investment[3/] | |
| Pond Construction (5,000m$^2$) | (7,500) |
| Seine | ( 200) |
| Operating Expenses | |
| Fingerlings (8,750 X $.04) | 360 |
| Bags, Fert., misc. | 120 |
| Feed ($14.50/qq) (216 qq) | 3,132 |
| Feed Transport | 268 |
| | 3,880 |
| Cash deficit | ( 80) |

1/ In a 5,000 m$^2$ pond stocked with tilapia nilotica. After a 3 month grow out period, partial harvests are made over 9 months then the pond is restocked.

2/ Yield of fish is expected to total 12,000 lbs. over a 12 month cycle, of which 33% is for home consumption and 66% for sale. Conversion rate is 1.8 lbs feed: 1 lb. fish.

3/ Grant Financed

# FISH-ONLY MODEL

## ECONOMIC RETURN

### Including Operating and Pond Construction Costs

| Year | Operating Expenditures | Labor | Investment | Total Expenditures | Total Income | Income Less Expenditures | Present Value (10%DF) | |
|---|---|---|---|---|---|---|---|---|
| 1 | 3,880 | 100 | 7,700 | 11,680 | 3,800 | (7,880) | (7,163) | |
| 2 | 3,880 | 100 | - | 3,980 | 3,800 | ( 180) | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | (943.) |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| TOTAL | | | | | | | (8,106) | |

NOTE: Charging an additional 11¢/lb. of fish would provide an additional annual income of $1,320 which would allow the model to given an IRR of 10%. The resulting price for participants and non-participants would be 26¢ and 51¢, respectively.

# TECHNICAL ANALYSIS

## A. Status of the Panamanian Freshwater Fish Culture Program

Freshwater fish are being cultured by low class rural Panamanians in an attempt to raise nutritional and economic standards. The principal species of fish cultured is Tilapia nilotica or a Tilapia nilotica hybrid. Some common and silver carp are also being raised in limited numbers.

Two basic systems are being used to culture these fish. The first method is an integrated system involving pigs and/or ducks, fish, and vegetable gardens. Wastes from the animals are used to fertilize large fish ponds to increase fish production. The nutrient rich water from the fish ponds is used to irrigate vegetable gardens. The pigs are sold for economic gain. The fish and vegetables are eaten by the community. The fish are partially harvested at predetermined intervals and the pond is drained and fish totally harvested once a year. Most of the tilapia harvested are small as there is no tilapia reproduction control in these ponds.

The second system is to culture Tilapia hybrids in small, hand dug ponds. The tilapia hybrids are a generally males so that reproduction is reduced and a larger fish can be raised. The fish are fed on a commercially prepared ration that results in fast growth and very high production in a 3 to 4 month period. The ponds are harvested and some fish are sold to recover the feed costs while the remaining fish are consumed locally.

In a short 3 to 4 year period, over 200 fish ponds have been constructed in a country with no past history of fish culture.

Problems that have been encountered and must be solved are:

1. In its efforts to promote fish culture, the government has become heavily involved in subsidizing several aspects of the culture process. Large fish ponds are being built with government economic assistance, there is no direct cost to the farmers. The government is transporting piglets to be fattened, pig feeds, and the fattened pigs to market at no cost to the farmers. Medicines, fertilizers, insecticides and other needed materials are

often bought and/or transported to the farmers. In small ponds where fish feeds are used, the government extension service is distributing the ration to the farmers free of transportation costs.

These services are costing the government a great deal of expense and labor. If for any reason the government is unable to continue subsidizing these services, the farmers will be unable to continue fish culture themselves; the project will fail. The expense in manpower, vehicles and gasoline will become a much greater burden as the project expands to encompass the entire country. Methods have to be found to reduce the dependence of the farmers on the Panamanian government for these necessary services.

2. As is normally the case in initial fish culture efforts in developing countries, the government is producing and distributing fingerlings for the farmers to raise. After each harvest, the ponds are restocked by the government. This stocking and restocking demands a great deal of time and expense. With the world facing serious energy shortages and increased prices, the government can't afford to stock large numbers of small ponds several times a year.

Fish culture systems must be developed that allow the communities to produce their own fingerlings for stocking. The government has to make plans to eventually get out of the fingerling production business. In most of the countries in the world where fish culture is successful, fingerling production is controlled by the private sector.

3. Any agricultural activity that is successful on a national scale normally has competent government institutions providing assistance in extension, research and training. All these areas are deficient in the newly initiated aquaculture program in Panama. This is quite normal at this stage of development. The Panamanian government needs strengthening in all these vital areas. Trained manpower and installations are needed so that Panama can hire more extension workers which can be trained in-country. Research needs to be performed at a properly constructed installation to resolve some of the pressing questions facing Panamanian fish culture.

## B. Alternative Systems for Raising Fish in Panama

### 1. Tilapia

a. Species - Tilapia nilotica, already found in Panama, is considered by most knowledgeable biologists to be the best tilapia for culture in tropical regions.

(1) Advantages

(a) Tilapia nilotica reproduces naturally year round under a wide variety of environment conditions. The fish is easily reproduced by even inexperienced fish farmers. Fingerlings are available year round.

(b) Tilapia nilotica is a fast grower, being one of the fastest growing tilapias.

(c) Tilapia nilotica is very resistant to poor water quality and low dissolved oxygen levels. This is an extremely important characteristic when inexperienced farmers are raising fish associated with animal husbandry. One of the principal limitations to culturing fish is mortality due to low dissolved oxygen levels. This is especially true when large amounts of organic matter, e.g. animal manures, are washed into fish ponds in varying amounts. Tilapia nilotica is able to live for many hours in water with dissolved oxygen of less than 1ppm by coming to the water surface and utilizing the more highly oxygenated surface water in contact with the atmosphere. Only under the most extreme poor water quality conditions will Tilapia nilotica die.

(d) Tilapia nilotica is very resistant to diseases. There are no documented cases of massive mortalities of Tilapia nilotica due to disease in ponds where tropical water temperatures exist. Mortality due to diseases is a serious problem in many fish cultures necessitating treatments with chemicals and drugs. These chemicals and drugs are very expensive in developing countries when available. A disease resistant fish is very important when dealing with inexperienced fish farmers.

(e) Tilapia nilotica feeds low on the food chain and can efficiently utilize agricultural by-products and manures to produce high standing crops. Tilapia nilotica feed principally on phytoplankton filtered from the water. This allows for an efficient utilization of natural pond fertility.

(f) Tilapia nilotica is a good quality eating fish which is usually greatly appreciated by the consumer.

(2) Disadvantages

(a) Tilapia nilotica reaches sexual maturity at a young age and begins reproducing in the fish pond at a small size. Unless some type of reproduction control is used, uncontrolled reproduction in the grow-out pond leads to overpopulation resulting in many small, stunted fish which are often unacceptable to consumers.

2. Systems for Raising Tilapia

a. With reproduction control

(1) Advantages

(a) Tilapia nilotica can be stocked one time into a fish pond and then partially harvested over a period of years before the pond has to be cleaned and restocked. The tilapia are continually reproducing in the pond, replenishing tilapia stock and eliminating the need for the government to hatchery produce fingerlings for repeated stockings.

(b) Where the need for protein is great and the people will accept a small fish, there is no better or simpler method of producing fish protein available today.

(c) Higher production can be obtained from a tilapia pond using this system than with any other tilapia production system.

(2) Disadvantage

(a) The people must be willing to consume a small fish as the majority of the fish produced will be small.

b. With reproduction control

Reproduction control is used so that a larger tilapia can be produced.

(1) Use of predacious fish

(a) Advantages

(i) The simplest reproduction control system. This system has been successfully used in El Salvador. Tilapia fingerling production is easy as mixed male and female fingerlings are stocked.

(ii) Allows the tilapia to remain in the grow-out pond for as long as is needed to reach marketable size because the preclator is constantly eating the tilapia young.

(b) Disadvantages

(i) A good, native predator fish is needed. It is dangerous to introduce an exotic predotor because of potential econological damage. Panama does have a good native predator available.

(ii) This system usually results in the lowest production of any tilapia production system.

(iii) Two species of fish are being worked -- necessitating more facilities and expense to produce the fingerlings.

(iv) Repeated pond drawing to harvest fish will require repeated fingerling stocking.

(2) Stocking of faster growing male fish

(a) Advantages

(i) High production of larger, faster growing males

(b) Disadvantage

(i) Tilapias must be hand sexed to separate males from females resulting in added handling and labor.

(ii) Females are not raised so they are often wasted even though there are costs bringing the females to sexing sizes (40-60g). However, in Panama females can be consumed by humans or animals or can be ground up to be used as fish feed.

(iii) It is very difficult to sex 100% male fish and a small percentage of females usually enter the grow-out pond. The small amount of reproduction resulting from the introduced females does not normally harm male growth over a 6 to 8 month period. However, if the males are left in the grow-out pond for a year, tilapia reproduction can reduce the growth of the males.

(iv) Male tilapias are normally harvested every 6 months so repeated stockings are needed resulting in added expense to the government for fingerling production and transport. Sexable male fingerlings are more costly to transport because their size reduces the number that can be carried each trip.

(v) Farmers can be taught to produce and sex their own male fish as sexing is not difficult. However, two fish ponds are needed, one for producing sexable fingerlings and the second for fattening the male fish.

(3) Hybridization

By crossing two species of tilapia we can produce all-male or a majority of male off-spring. Panama has two species of tilapia which, when the male Tilapia hornorum is crossed with the female Tilapia nilotica, produces 100% male off-spring.

(a) Advantages

(i) All male offspring eliminate the need for hand sexing and reducing labor costs.

(ii) The hybrids show hybrids vigor resulting in increased growth rates.

(iii) High production

(b) Disadvantages

(1) Rigid controls are needed to ensure that tilapia stocks remain pure as only pure stocks produce 100% male offspring.

(2) The hybrid is fertile and able to backcross with the female parent which results in offspring 50% male and 50% female.

(3) For reasons not well understook, the hybridization of 2 species results in reduced numbers of offspring when compared with pure stock offspring numbers.

(4) The technology needed to produce tilapia hybrid fingerlings is the most sophisticated of all the tilapia culture systems mentioned. At this time hybrid fingerlings will have to be produced by highly motivated wealthy farmers with proper hatchery facilities or by the government.

(5) Repeated stocking of hybrid fingerlings will be needed resulting in high cost to the government.

3. The Chinese carps

The silver carp, grass corp, bighead carp, and common carp which are all native to China have been introduced to Panama. Several of the chineses carps are widely distributed around the world with the common carp being the most widely cultured fish in the world. These fishes can be cultured together, polyculture, because they utilize different natural foods within the fish pond resulting in maximum fish production. Polyculture systems are an excellent way to increase fish production.

(a) Advantages

(1) These carps will not spawn in a pond environment or do not spawn at an early age thus allowing a large fish to be raised.

(2) All Chinese carps feed low on the food chain so that good production can be realized by feeding grasses and leaves and/or by fertilizing with animal manures.

(3) The Chinese carps feed low on the food chain allowing for maximum utilization of natural pond food organisms.

(b) **Disadvantages**

(1) All the Chinese carps except the common carp will not spawn in a pond environment requiring artificial spawning. Artificial spawning techniques are not easy and require relatively high levels of technology which only the Panamanian government has at this time. Thus, fingerlings of these carps will have to be produced by the government. Repeated pond stockings will be necessary involving transportation costs.

(2) Two of the Chinese carps, the silver and common carps are quite ugly and may be difficult to sell in the market.

(3) The Chinese carp are not as resistant to poor water quality (low dissolved oxygen levels) and diseases as are Tilapia Nilotica. Where the carps are in polyculture with the tilapias, added care will be needed to ensure good water quality, especially in systems receiving a lot of animal manures, so that the carps do not die. This will place an added burden on the extension service as more attention will have to be given to each pond to avoid fish mortalities.

(4) Culturing more than one fish places on added burden on the government because a large hatchery facility is needed to produce fingerlings.

C. Technical Recommendation for the Implementation of a Managed Fish Production Program

1. The government must slowly reduce their subsidized services to fish farmers. Costs to the government will be too much to bear if fish culture is to expand to a national scale. However, this is not very easily accomplished given the economic level of the Panamanian population involved in fish culture and their extreme isolation in mountainous regions in some cases. For fish culture to normally be a worthwhile activity in small ponds, some sort of feeding or fertilization program must be encouraged to raise fish production. Thus, commercial rations or animal manures are used. Commercial fish rations are fine where the farmer has the money to buy and access to the feeds. However, many of the fish farmers are in areas where feeds are not available and must depend on the government to transport the feeds to them. Use of animal manures would seem the most practical and efficient way to raise fish. However, even this method involves the transportation of hog feed.

Demonstration projects are needed that are completely integrated, reducing to a minimum the dependence of the farmers on the government. Farmers will have to be taught to produce their own fish fingerlings and piglets for fattening. All or a major part of the pig feeds must be raised by the farmers. While the dependence of the farmers on the government can't be completely eliminated at this time a reduction can be made.

While integrated fish-animal-crop projects have been performed for many hundreds of years in China, there is not one example in Latin America. Thus, extreme care must be taken to locate these completely integrated projects in areas where proper land and water resources exist, the people are hard-working and cooperative, and the site is readily accessible so that extension workers can work closely with the communities in an attempt to assure success. These pilot projects should be located in several provinces of Panama to stimulate and demonstrate to the people the potential of integrated agriculture.

However, it should be remembered that this type of completely integrated project is truly a pilot effort and many problems are sure to develop. Technical expertise will be needed not only in fish culture but in animal husbandry and grain and vegetable production as well. Data should be well collected and analyzed for economic and nutritional benefits.

2. Fish production systems have to be developed that allow the farmers to produce their own fingerlings. At this time, systems utilizing pure Tilapia nilotica are the only practical systems available to lower income farmers. Two systems can be used:

a. Mixed sex culture without reproduction control.

After the initial stocking of a single pond, the tilapia will reproduce in the grow-out ponds replacing fish periodically harvested. The fish produced in this system will be small. When the culture pond has to be drained for repairs or removal of pond muds for use on gardens, small fingerlings can be held in a small, hand dug 50 $m^2$ pond for restocking.

b. Monosex culture of males

This system will require two fish ponds, a smaller reproduction pond and a larger grow-out pond for selected male fish. The initial stocking of Tilapia nilotica is done by the government. The tilapia reproduce in the smaller pond and when they reach a sexable size, 40-50g, the males are sexed and transferred to the grow-out pond. Female tilapia not stocked and small tilapia reproduction can be eaten by the people. The males are grown to a marketable size were they can be sold to recover culture costs or consumed locally. It is improbable that the farmers will be able to sex 100% male fish and a few females are sure to be accidentally stocked. This will result in some reproduction in the grow-out pond. However, the small amount of reproduction will not interfer with the growth of the stocked males in a six month culture period. The male grow-out pond can also be stocked with a few predator fish that will control the tilapia reproduction allowing a continual partial harvest of marketable males and restocking with small males.

Use of the all-male tilapia hybrid and the Chinese carps should not be discouraged as these species are useful in certain culture situation and for increasing fish production through polyculture. The government can and should continue to hatchery produce these species and distribute them to farmers as long as they are economically able to do so. However, the technical difficulty in reproducing these species limits the production of fingerlings to the government in the near future. Thus, the principal fish cultured should be T. nilotica which allows the farmers to produce their own fingerlings and remain independent of the government.

3. Scale of the proposed project - some question has been raised as to the ability of the farmers to handle large fish ponds, 5,000 $m^2$, and the required large number of pigs/pig/100 $m^2$ and crop production needed to fertilize the fish pond and feed the pigs, respectively. There is a strong economic benefit in the construction of larger units as opposed to various smaller units. Also, consideration must be given to the number of people in the cooperative, the topography of the land and the desired social effects of the project. If a large number of people are participating or there is a desire to attract widely spread families to concentrate in a given region, large ponds would be desirable. If fewer people are involved or the logistics of feeding and selling a large number of pigs is too great, then smaller ponds may be preferable.

There are so many variables involved with making a decision on the scale of the project that it is recommended that no rigid constraints be placed on the scale of each fish pond. Determinations as to the size of each fish pond should be left to the people directly involved with the project depending on the objectives and circumstances of each situation. There may be advantages to having a variety of pond sizes so that objective comparisons can be m[illegible] at project termination.

4. Location of the projects

Consideration has to be given as to the selection of sites for the fish ponds. It is desirable to build ponds in regions where the people have the greatest nutritional needs. However, people with the greatest nutritional needs are normally those that live in the most inaccessible areas. Often, roads have not been constructed or the available roads are precarious and often impassible in the rainy season. Consideration has to be given to the ability of extension workers to visit projects on a regular basis, the expense to the Panamanian Government in gasoline and vehicle maintenance, and the importance of collecting good data so that the benefits of the fish ponds and related activities can be documented.

It is recommended that a compromise in the location of the fish ponds be used. Fish ponds should be located in regions where they are accessible to extensionists the entire year without great great hardship. At the same time, the ponds should be built in communities where the economic and nutritional benefits will be maximized. This means that the poorest of the poor located in the

mountainous regions of Panama may not be involved in this USAID funded project but more centrally located rural poor will be effected. The completely integrated fish-animal-crop demonstration pilot projects will need close supervision if they are to succeed. Animals and agricultural products produced on centrally located projects will reach markets with less labor and expense to the cooperatives. The ability of the Panamanian Government to manage this project will be easier and chances of success greater.

5. Rural Credit

The cooperatives and families involved with this project will need a source of money to buy feeds, seeds, medicines, materials, etc. The amount of money involved is not a great amount but the people normally do not have any ready cash. At this time, the aquaculture section of MIDA is aiding the people finance capital needs by loaning them money from a revolving fund. Upon the sale of fish, pigs, or vegetables the amount of money borrowed is paid back into the fund. This gives the people with fish ponds a ready source of interest free money with a minimum of bureaucracy. Apparently, non-payment of loans has not been a problem.

Attempts are now being made to transfer the revolving fund from the centralized aquaculture department to the regional extension services directly working with the people. This is to be recommended. However, some interest to cover inflation should be charged on all loans. Interest fee loans would require continued government subsidizing and a great deal of money if fish culture obtains national status. Interest to cover inflation would reduce greatly the need for continual governmental financial inputs. Also, the people will become accustomed to paying interest so that going directly to rural credit banks will be easier in the future. The use of a revolving fund has been successful to date and has made the promotion of fish culture much easier. As long as the central Panamanian Government is willing to finance a revolving fund to the rural poor for fish culture, it should be continued until fish culture is a widely accepted activity when a more conventional system of financing rural projects can be used.

6. Extension

Initially, fish culture extension was performed by the department of aquaculture but this activity has been transferred to the regional directorates of MIDA. This transfer of the fish culture extension service appears to be a positive move as

the extension activities are now in the hands of those people trained and supported to do so. MIDA regional offices also contain technicians knowledable in animal husbandry and agriculture. The department of aquaculture can not direct their attention to the bureaucratic requirements of government service.

More extension workers in fisheries are needed, especially if the fish culture program is expanded to more provinces. These newly hired personnel will have to receive training in fish culture methods.

The size of this project should recognize the ability of the Panamanian Government to hire extensionists, provide training, vehicles, and other materials, and financial support. There is no sense in building a large number of fish ponds over a wide area of Panama if the Panamanian government is unable to provide extension support. It is important to have successful fish ponds and associated activities at this early stage of development and without extensionists, the chance of success is greatly reduced. Thus, it is recommended that the number and location of fish ponds be realistically coordinated with the Panamanian governments ability to hire and support extension programs. Better to have a small number of successful fish ponds than a large number of failures.

7. Training

This is an area where Panama needs assistance. There is a need for trained personnel in all branches of fisheries work. An in-country training program needs to be developed for the training of extension workers. Several fish ponds will be constructed at MIDA experimental stations to serve as training aids for extension workers as well as to promote fish culture in areas not familiar with fish culture. The Divisa fish hatchery will be expanded to permit the training of extension personnel. Training will be performed by experienced Department of Aquaculture personnel and the long term technical advisor provided by the project.

Long term academic education in the U.S. at the graduate level is also needed to train competent fisheries administrators, researchers, and teachers. Teachers are needed that can help train extension workers. Competent researchers are needed to help solve some of the pressing questions concerning Panamanian fish culture efforts. Money should be provided to help establish in-country training programs for fish culture extensionists and long term graduate studies at the M.S. level in the U.S. for qualified Panamanians.

8. Installations

Expansion of the present Divisa fish hatchery is needed to provide fish fingerlings for existing and proposed fish ponds. The present Divisa hatchery is not large enough to produce the tilapia and chinese carp fingerlings needed to stock existing fish ponds. The proposed integrated fish culture project will attempt to provide a system where the farmers are able to produce their own tilapia fingerlings for stocking. If successful, this will reduce some of the demand on the Divisa hatchery for fingerlings. The Department of Aquaculture will continue to produce hybrid tilapia and chinese carp fingerlings as these species have advantages in certain culture systems and can increase productions in most situations. Initial acceptance of the silver carp has been excellent among fish farmers and as acceptance expands and problems reproducing the silver carp and other chinese carp are overcome, the need for fingerlings will increase. More hatchery ponds will be needed to produce additional fingerlings to meet expected demand.

The new ponds to be built at Divisa and financed in part with USAID funding should not only be considered as fingerling production ponds. The 40 new ponds to be built will be more than enough to supply fingerlings for the USAID financed fish ponds. If the concept of farmers producing their own fingerlings is successful, a reduction in the number of hatchery ponds needed to produce fingerlings may occur. However, ponds are desperately needed for research and training. At this time, there is little or no research being performed because all available Divisa ponds are being used for fingerling production.

Some Divisa ponds should also be made available for training extensionists. There is no better way of teaching a future fish culture extension worker than by allowing him an opportunity to raise a crop of fish. What better way to gain knowledge and confidence than by first hand experience in raising fish?

# INITIAL ENVIRONMENTAL EXAMINATION

**Project Location:** Panama, R. P.

**Project Title:** Managed Fish Production 525-0216

**Funding:** FY 1980 $992,000

**Life of Project:** Three years

IEE Prepared by: Jane E. Stanley/Robert E. Jordan Date: August 29,1979

**Environmental Action Recommended**

This IEE has identified no significant impacts on the natural or human environment. Therefore, the Mission recommends the Project be given a Negative Determination.

Concurrence: _____ Date: Sept. 5, 1979
Aldelmo Ruiz
Mission Director

Assistant Administrator's Decision: _____

Signature: _____ Date: _____

# INITIAL ENVIRONMENTAL EXAMINATION
# MANAGED FISH PRODUCTION PROJECT

## I. PROJECT SETTING:

Many of Panama's rural areas, especially the more mountainous and inaccessible areas of Veraguas and Chiriqui Provinces, are plagued by problems of low income, underemployment and chronic malnutrition. The Missions 1981 CDSS found that the Province of Veraguas, in particular, had the largest concentration of poverty in its rural areas. In fact, 61% of this province's population and 94% of its rural population is living below the extreme poverty level ($160 per capita in rural areas). Recent nutrition surveys in this province found 79% of its 1-4 year olds and 70% of its 5-17 year olds were malnourished.

Most of the soils in these improvished areas are unsuitable for agricultural use. Yet most of the area's residents are subsistence farmers who have cut and burned large tracts of forested land to make way for agricultural plots. The soils on these small farms quickly become eroded and unproductive due to overutilization, and most farmers are barely able to grow enough to feed their own families.

The major food resource of the residents of these areas are the crops they grow, which provide them with a diet largely consisting of carbohydrates and some vegetable protein. Expensive animal protein is inadequate or virtually lacking in most families diets, because surrounding wildlife and fish resources, which were formerly utilized by these people, have been nearly exhausted and there is little income to buy such protein sources in the market.

## II. PROJECT DESCRIPTION

The major goal of the managed Fish Production Project is to improve the nutrition and income of Panama's rural poor through the introduction of fish culture and related livestock and gardening activities. The purpose of this three year project will be to strengthen the capacity of the Ministry of Agricultural Development's National Directorate for Aquaculture (DINAAC) to promote fish ponds in rural Panama.

The project's purpose will be achieved through the following activities:

1) The improvement of DINAAC's technical capacity to extend the technology for integrated fish-pig-vegetable projects through staff expansion, technical assistance and training.

2) The establishment of integrated fish-pig-vegetable demonstration projects in 30 of the poorer communities of Panama, primarily in Veraguas and Chiriquí Provinces. Such ponds will be approximately 5000m$^2$ in size and serve an average of 315 people.

3) The expansion of DINAAC's fingerling production capacity at its fish hatchery in Divisa through the establishment of 40 additional ponds and the adquisition of specialized equipment.

4) Expansion and up-grading of DINAAC's research facilities.

The fish-pig-vegetable activities will be closely supervised by DINAAC personnel. In the 30 communities for demonstration ponds DINAAC will select the pond site with community concurrence and assist in the construction of a machine dug pond, a diversion dam for the pond's water supply, and pig pens. In all communities a moderate amount of labor will be required of community members. DINAAC will then stock the fish pond. Once the pond is in operation the community will have full responsibility for the fish pond, care of the animals and preparation of a garden.

The large demonstration ponds will be stocked with tilapia and smaller numbers of carp and grass carp. When the full system is in operation, the ponds' water supply will first pass through the pig pens and carry manure and waste feed to the pond. Tilapia will utilize waste feed, manure and the plankton growing in the ponds nutrient rich water, while the smaller numbers of carp and grass carp utilize the pond's bottom organisms such as insects and vegetation. A garden will be established below the pond's outlet so that nutrient rich irrigation water will be available on demand. After three months' operation, ponds will begin to be harvested on a continual basis and will be drained and restocked once a year.

## III. ANALYSIS OF ENVIRONMENTAL IMPACTS

The overall impact of the Managed Fish Production Project's proposed activities should be beneficial.

Positive impacts on Panama's natural resources resulting from the establishment of fish-pig-vegetable projects include slight reductions of excess runoff and hence, possible erosion, due to the presence of fish ponds which will conserve some water high in a watershed and the elimination of pig manure and its possible hazardous health effects on rural villages through the utilization of this substance for fish feed.

While these positive impacts may be minor, all forseeable negative impacts on Panama's natural environment should also be minor. The diversion of water from small streams does have a potential for causing adverse effects on water resources. However, water will be diverted to fill a pond once a year during periods of high flow, therefore producing little steam flow reduction. At other times of the year only small amounts of water will be diverted to maintain pond levels, wash pig pens and provide irrigation water. Draining of the fish ponds could also produce some negative impacts on receiving water resources through contamination of these streams with organic wastes, nitrates and phosphates. However, ponds will be drained for

harvesting only once a year, and again, during periods of maximum stream flow. Thus such contaminants should be signigicantly diluted. Furthermore, the public health of downstream users of these receiving streams should not be endangered as most residents of the mountainous areas where these ponds are to be constructed use springs rather than streams for water supply. Some pond water may seep into the soil below the pond, however adverse effects on groundwater are not anticipated due to the scarcity of groundwater in these areas.

The earth-moving activities including the construction of some short access roads, necessitated by the construction of diversion dams and fish ponds may increase sedimentation in nearby streams. Nevertheless this unavoidable adverse effect should be short-term and minor. In addition, bare soil on pond banks will be replanted with ground cover once ponds are constructed.

Non-native fish species used in the ponds could escape into nearby streams causing unknown impacts on local fish species. Yet, although it is conceivable that pond fish could survive, it is unlikely that they will thrive, as they would not be accustomed to the fast-flowing, nutrient poor conditions of local streams. In addition, in many areas of the country, most native fish fauna have already been destroyed by drastic environmental changes and overfishing methods such as poisons.

The project's impacts on Panama's human environment should be quite positive as it is projected that the fish-pig-vegetable activities will raise the socio-economic level of approximately 18,000 to 23,000 residents of some of the country's poorer rural communities. The nutritional status of these people will be improved due to greater availability of vegetables and of high quality animal protein from both hogs and fish.

In some communities excess vegetables fish and hog products will be sold, thus increasing the income of many families involved in operating these fish-pig-vegetable systems. In addition the Project's economic analysis predicts that employment generated by the 30 large projects will be equivalent to 16,500 man-days. (.06% of the tatal national employment).

In the 30 communities where a bulldozer is brought in for fish pond construction, a passable road may be constructed, if required. Such a road will provide greater access to the community by government health and extension workers. Also because of this road, teachers will be readily available for a community's schools and children's attendance at school will most likely improve. Passable roads will also make it easier for a community's residents to reach markets where they can sell their produce.

The projects should also have a desireable effect on community cohesion. It has been found that in many communities where fish ponds have already been established, a high level of community co-operation exists and that oftentimes the success of a fish pond has led to the undertaking of other community improvement projects.

Finally, the fish ponds will not create conditions that will jeopardize a community's public health. Although ponds could increase the breeding of mosquitoes that are vectors of disease, both Filapia and carp consume mosquitoe larvae, so their survival in heavily stocked ponds is unlikely. Shistosomiasis, which can be a health hazard in fish ponds in some parts of the world, is not endemic in Panama.

## IV. SUMMARY AND RECOMMENDATIONS

The project should create only minor impacts on Panama's natural environment. Furthermore, its impacts on Panama's human environment should be quite positive in terms of improving income, the employment status and the nutritional level of Panama's rural poor. Based on these findings, this IEE recommends that the Managed Fish Production Project be given a Negative Determination, thus requiring no further environmental review.

ANNEX IX

# SOCIAL SOUNDNESS ANALYSIS

## MANAGED FISH PRODUCTION PROJECT, USAID/PANAMA

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# INTRODUCTION

As of 1976 there were, in effect, no managed fishponds in Panama and certainly none whose principal purpose was to improve the well-being of nutritionally and economically disadvantaged populations. As of September 1979, the labors of the National Directorate for Aquaculture (DINAAC) had generated, in 22 districts and 107 different communities, a total of 192 fishponds. Seventy-two of these were defined as 'small' community ponds (size range $50m^2$ to $40,000m^2$). Average size for the former is $302m^2$, for the latter $3,748\ m^2$. The total area of these community ponds is $306,085\ m^2$. Project locations are listed in Table I and mapped in Figure 1 below. DINAAC estimates fish consumption at 158,085 pounds, with benefits to 19,438 persons per year./[1]

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1 Ministerio de Desarrollo Agropecuario (MIDA). ACUMULATIVO ACTUAL SEPTIEMBRE 1979: ESTANQUES CONSTRUIDOS PARA PECES Y SUS AREAS CORRESPONDIENTES. Santiago, Panama: Dirección Nacional de Aquacultura (DINAAC).

TABLE 1. LOCATIONS AND AREA ($M^2$) OF SMALL AND LARGE COMMUNITY FISHPONDS.

| District | Large/[1] Ponds | | Small/[2] Ponds | |
|---|---|---|---|---|
| | Number | Total Area ($m^2$) | Number | Total Area ($m^2$) |
| Las Palmas (V)/[3] | 18 | 71,600.4 | 9 | 2,436.9 |
| San Francisco (V) | 5 | 18,745.6 | 13 | 4,536.1 |
| Montijo (V) | 2 | 8,400.0 | -- | ------- |
| Atalaya (V) | 1 | 4,288.0 | 2 | 325.7 |
| Cañazas (V) | 5 | 8,736.6 | 2 | 200.0 |
| Santa Fé (V) | 3 | 8,100.0 | 36 | 9,466.2 |
| La Mesa (V) | 2 | 2,999.3 | 10 | 2,665.7 |
| Río de Jesus (V) | 2 | 5,890.8 | 1 | 800.0 |
| Calobre (V) | 2 | 3,441.0 | -- | ----- |
| Santiago (V) | 14 | 91,716.0 | 24 | 6,929.1 |
| Olá (C) | 3 | 13,700.0 | -- | ------- |
| Las Minas (H) | 1 | 1,372.0 | -- | ------- |
| La Pintada (C) | 3 | 6,000.0 | 1 | 500.0 |
| Panamá (P) | 1 | 2,500.0 | 1 | 400.0 |
| Antón (C) | 3 | 8,000.0 | 1 | 700.0 |
| Soná (V) | 1 | 1,000.0 | 5 | 1,100.0 |
| Penonomé (C) | 4 | 7,800.0 | 10 | 4,575.0 |
| Natá (C) | 2 | 5,561.0 | -- | -------- |
| Tolé (Ch) | - | -------- | 1 | 600.0 |
| Chorrera (P) | - | -------- | 2 | 650.0 |
| Ocú (H) | - | -------- | 1 | 200.0 |
| David (Ch) | - | -------- | 1 | 150.0 |
| TOTAL | 72 | 269,850.70 | TOTAL 120 | 36,234.7 |

Source: Ministerio de Desarrollo Agropecuario (MIDA). ACUMULATIVO ACTUAL SEPTIEMBRE 1979: ESTANQUES CONSTRUIDOS PARA PECES Y SUS AREAS CORRESPONDIENTES.
Santiago, Panama: Dirección Nacional de Aquacultura (DINAAC).

1 'Small' = 50 $m^2$ to 999 $m^2$. Largest pond in this category is 970.5 $m^2$.

2 'Large' = 1,000 $m^2$ upward. Largest pond in this category is 40,000 $m^2$.

3 V = Veraguas Province, C = Coclé, H = Herrera, P = Panama, Ch = Chiriquí

FIGURE 1. MAP OF DINAAC COMMUNITY FISHPONDS, BY SIZE, PRODUCTION MIX, LOCATED BY PROVINCE AND DISTRICT

## THE SETTING

Ten of the districts in which fishpond projects have been generated are in Veraguas, which as of September 1979 had 55 large (76% of the total of 72) and 102 small (85% of the total of 102) fishpond projects. In $m^2$, Veraguas had 83% (224,217 $m^2$) of the total area in large ponds and 85% (28,456 $m^2$) of area in small ponds. In total, Veraguas had 157 out of the 192 DINAAC community projects nationwide, or 85%, for a total area of 252,667 $m^2$, 83% of the 306,085 $m^2$ project total. Second, though far behind, was the Province of Coclé, with 27 projects, or 77% of the projects outside Veraguas. The provinces of Panamá, Herrera, and Chiriquí have 4, 2, and 2 fishpond projects, respectively.

The concentration of effort in Veraguas makes eminently good sense. The province as a whole has the highest incidence of extreme poverty, with 62% of its population below the poverty lines established in the CDSS for 1981-1985, 94% of whom live in rural areas. The upper poverty line marks the limit of income adequate to provide for a family's basic, minimal needs, calculated at B/304 per capita per annum for rural areas (based on consumption costs for 1978, adjusted by area). The lower, or extreme poverty line, marks conditions of serious vital deterioration and is calculated at B/160. Correspondingly, Veraguas accounts for the lowest share of the national income, 3.4%. Mapped by districts which fall below national averages on three key indicators of basic needs, the major concentrations of poverty emerge

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1 USAID/Panama. COUNTRY DEVELOPMENT STRATEGY STATEMENT (CDSS) 1981 - 1985. January 31, 1979.

primarily in Panama's Central and Western regions, including all of the province of Veraguas and neighboring districts in Coclé, Herrera, Los Santos, and eastern Chiriquí. The numbers and percentages of the populations of that area under both poverty lines are presented in Table 2. The poorest districts so identified share the unhappy characteristics of poor soils, mountainous terrain, highly dispersed populations, lack of access roads, poor housing and sanitation, and limited access to potable water and health services. Population growth rates are only artificially low, due largely to the increasing tendency of the population to migrate out, especially to Panama City. Highest rates of such migration occur in Veraguas and Chiriquí. The synergisticsamong great need, high dispersion, and difficult access are extremely resistant to most efforts at development in the area. Table 3, which lists key quality-of-life indicators for the poorest districts of Panamá, reflects the dimensions both of the problem and its potential for solution. It also suggests possible directions for the extension of the DINAAC program, an issue to be discussed below.

Beyond these characteristics, there is social fact that constitutes an additional limitation on development: the western districts of Veraguas and the eastern districts of Chiriquí have the nation's major concentration of the country's estimated 50,000 Guaymí Indians. 60% of the Guaymí live in Chiriquí, 10% in Veraguas, and 30% in Bocas del Toro, in an area designated as the Guaymí Comarca, whose boundaries are not firmly fixed by survey. /[1]

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1. The data on the Guaymí which follow are drawn from anthopologist Philip Young's social soundness analysis for the USAID/Panama Project Paper: GUAYMI AREA DEVELOPMENT, February 1979.

TABLE 4. KEY CHARACTERISTICS OF FISPOND SITES VISITED

| District/Site | Electricity | No. of Ponds | Area ($m^2$) | Construction | DINAAC Classification | Ownership | Level of Integration |
|---|---|---|---|---|---|---|---|
| **San Francisco** | | | | | | | |
| Lagartero | Latino | 1 | 555 | machine | small community | community | fish only |
| La Mona | Latino | 1 | 870 | hand+mach. | small community | community | fish plus garden |
| La Perdiz | Latino | 2 1/ | 430 | hand | small community | community | fish only |
| | | | 60 | hand | | | |
| **Santa Fé** | | | | | | | |
| Paja Peluda | Latino | 3 | 125 | hand | small community | community | fish only |
| | | | 130 | hand | small community | community | fish only |
| | | | 350 | hand | small community | community | fish only |
| **Las Palmas** | | | | | | | |
| Buenos Aires | Indígena | 2 | 6,114 | machine | large community | community | fish plus pigs/ducks plus garden |
| | | | 5,176 | machine | large community | community | fish only (use manure from pigs in #1) |
| Roble | Indígena | 2 | 3,840 | machine | large community | community | fish only (had pigs/not operating) |
| | | | 8,685 | machine | large community | community | fish only |
| Chumico | Indígena | 1 | 2,231 | machine | large community | community | fish plus pigs plus garden |
| Cucurucha | Indígena | 1 2/ | 3,230 | machine | large community | community | fish plus pigs |
| **Olá (Coclé)** | | | | | | | |
| Las Huacas del Quije | Latino | 1 | 2,000 | machine | large community | "community" 3/ | fish plus pigs |
| Hijo de Dios | Latino | 1 | n.d. (est.2500) | machine | large community | community | fish plus ducks |
| **Santiago** | | | | | | | |
| Paso Las Tablas | Latino | 1 | 148 | hand | small community | community | fish only |
| Canto del Llano | Latino | 1 | 1,500 | machine | large community | private | fish plus pigs(plus garden)(loosely integrated) |
| Coloncito | Latino | 2 | 349 | machine | small community | private | fish plus ducks |
| | | | 1,274 | machine | large community | private | fish plus dugs |
| La Normal | N.A. | 1 | 9,000 | machine | large community | vocational school | fish plus pigs(pen constructed/no pigs yet) |
| **Atalaya** | | | | | | | |
| Instituto Jesus Nazareno | N.A. | 1 | 4,288 | machine | large community | agricultural school | fish plus pigs(plus garden)Plus methane bio-digester |
| **Cañazas** | | | | | | | |
| Palo Verde | Latino | 2 4/ | 100 | hand | small community | private | fish only |
| | | | 100 | hand | small community | private | fish only 5/ |

1/ Informants at this site said there were 5 more private, or family, ponds in construction, but no additional information was available.
2/ A 'natural' pond with some fish was also in use and was being considered for improvement.
3/ While fish from this pond was distributed to the community, management was effectively in the hands of MIDA and outside hired employees
4/ Informants said there were 2 more private ponds; no other information
5/ All ponds seen used polyculture, i.e., various mixtures of tilopia and carp (see technical analysis)

TABLE 2. ESTIMATED POPULATION (NUMBERS AND PERCENT)

BELOW POVERTY LINES IN FIVE PROVINCES

| PROVINCE | ESTIMATED POPULATION | | | | | | ESTIMATED POPULATION BELOW POVERTY LINE | | | | | | ESTIMATED POPULATION BELOW EXTREME POVERTY LINE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOTAL | | RURAL | | URBAN | | TOTAL | | RURAL | | URBAN | | TOTAL | | RURAL | | URBAN | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Chiriqui | 287,140 | 16 | 207,810 | 23 | 79,330 | 9 | 106,923 | 15 | 83,124 | 16 | 23,799 | 12 | 49,495 | 13 | 41,562 | 14 | 7,933 | 8 |
| Veraguas | 173,140 | 9 | 148,170 | 16 | 25,790 | 3 | 141,090 | 20 | 133,353 | 26 | 7,737 | 4 | 106,298 | 28 | 103,719 | 36 | 2,579 | 3 |
| Los Santos | 73,410 | 4 | 65,110 | 7 | 8,880 | 1 | 14,798 | 2 | 13.022 | 3 | 1,776 | 1 | 7,399 | 2 | 6,511 | 2 | 888 | 1 |
| Herrera | 83,490 | 5 | 54,730 | 6 | 28,760 | 3 | 46,939 | 6 | 38,311 | 7 | 8,628 | 4 | 19,195 | 5 | 16,419 | 6 | 2,876 | 3 |
| Cocle | 144,730 | 8 | 111,305 | 12 | 32,925 | 4 | 62,486 | 9 | 55,900 | 11 | 6,586 | 3 | 25,653 | 6 | 22,361 | 8 | 3,292 | 3 |

Source: USAID/Panama. COUNTRY DEVELOPMENT STRATEGY STATEMENT (CDSS) 1981 - 1985. January 31, 1979.

TABLE 3. DISTRICTS WITH LOWEST LEVELS OF SATISFACTION OF BASIC NEEDS

| Province District | Total Pop. | Pop. Disp. | Annual Pop. Growth | Infant Mort. | Birth Rates | Illiteracy | Road Density | Houses w/o Elect. | Houses w/o approved $H_2O$ Source | Houses w/o approved sanitary facili. | Houses W Dirt Floors | Drs.per 10,000 Popula. | un-attended births | Econo. Active Popul. Devoted to Agr. | Farms w/less than $500 in sales | Farms Receiving Agri. Credit | Farms Receiving Tech. Ass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| National Average: | ----- | 62.0% | 3.1% | 28.5 | 28.1 | 13.8 | 5.4 | 48.1 | 35.7 | 28.3 | 32.7 | 6.0 | 23.4 | 39.9 | 8.2% | 17.5% | 5.0% |
| **Veraguas** | | | | | | | | | | | | | | | | | |
| Cañazas | 15,590 | 90.7 | 1.5 | 30.9 | 35.3 | 61.5 | 0.8 | 96.5 | 92.0 | 89.0 | 94.5 | 0.6 | 77.3 | 93.1 | 94.6 | 6.9 | 1.1 |
| Las Palmas | 18,140 | 95.8 | 0.4 | 28.9 | 34.2 | 53.4 | 6.9 | 97.5 | 79.7 | 74.0 | 80.6 | 0.0 | 62.3 | 87.7 | 90.1 | 8.1 | 1.1 |
| San Fco. | 8,610 | 87.3 | 1.3 | 47.2 | 56.9 | 43.8 | 8.0 | 92.5 | 84.8 | 81.1 | 88.5 | 1.1 | 74.5 | 85.1 | 94.2 | 16.5 | 2.4 |
| Sta. Fe | 7,950 | 100.0 | 0.4 | 50.9 | 42.0 | 54.3 | 1.2 | 99.7 | 97.2 | 87.8 | 85.2 | 1.3 | 85.3 | 88.6 | 95.6 | 7.9 | 2.1 |
| Calobre | 12,040 | 94.6 | 0.7 | 15.1 | 33.0 | 35.1 | 5.0 | 97.2 | 86.7 | 76.0 | 89.9 | 0.8 | 70.1 | 88.3 | 84.4 | 20.3 | 1.4 |
| La Mesa | 11,340 | 91.8 | 0.7 | 21.5 | 32.7 | 31.9 | 11.9 | 94.6 | 79.7 | 79.2 | 88.3 | 0.9 | 51.2 | 90.1 | 95.6 | 4.2 | 2.7 |
| Soná | 25,520 | 79.5 | 1.6 | 20.7 | 32.2 | 47.4 | 6.9 | 89.8 | 74.2 | 74.0 | 83.7 | 0.7 | 71.6 | 76.3 | 90.5 | 13.5 | 6.5 |
| **Chiriquí** | | | | | | | | | | | | | | | | | |
| Gualaca | 6,690 | 99.3 | 0.7 | 36.7 | 32.6 | 36.2 | 3.3 | 88.6 | 87.8 | 57.5 | 72.6 | 1.5 | 40.8 | 79.7 | 75.2% | 21.1% | 2.8% |
| Remedio | 6,200 | 98.3 | 1.7 | 44.2 | 29.2 | 57.5 | 5.1 | 84.2 | 96.6 | 65.4 | 40.7 | 1.6 | 63.5 | 72.8 | 80.0% | 15.5% | 3.6% |
| San Félix | 8,710 | 98.4 | 1.6 | 28.5 | 32.3 | 58.1 | 9.0 | 79.8 | 54.8 | 52.8 | 68.7 | 3.5 | 73.7 | 75.2 | 82.4% | 19.9% | 2.7% |
| Tolé | 22,460 | 98.6 | 1.4 | 34.2 | 29.9 | 72.1 | 2.2 | 94.6 | 94.2 | 87.1 | 86.1 | 0.9 | 86.3 | 86.7 | 77.6% | 17.1% | 1.3 |
| Renacimiento | 8,730 | 98.6 | 1.4 | 37.2 | 33.9 | 19.4 | 8.6 | 98.6 | 71.7 | 65.4 | 75.3 | 1.2 | 41.2 | 87.5 | 62.2 | 33.9 | 2.5 |
| Bugaba | 44,142 | 33.4 | 2.0 | 31.7 | 29.3 | 12.3 | 31.6 | 65.6 | 70.2 | 35.7 | 37.5 | 0.2 | 22.6 | 58.5 | 78.3 | 23.9 | 4.3 |
| S. Lorenzo | 11,080 | 79.1 | 0.1 | 71.4 | 26.5 | 63.8 | 5.3 | 87.6 | 78.2 | 65.6 | 75.0 | 0.9 | 73.8 | 83.6 | 56.4 | 54.4 | 3.5 |
| **Coclé** | | | | | | | | | | | | | | | | | |
| La Pintada | 18,064 | 85.9 | 2.0 | 39.3 | 29.6 | 18.0 | 3.0 | 94.7 | 79.3 | 77.6 | 80.1 | 0.6 | 66.9 | 80.1 | 94.1 | 5.5 | 1.7 |
| Olá | 4,911 | 100.0 | 1.3 | 47.6 | 34.2 | 50.7 | 2.6 | 99.7 | 92.7 | 92.3 | 92.7 | 0.0 | 78.0 | 89.3 | 87.0 | 15.8 | 0.9 |
| Antón | 29,557 | 60.3 | 2.2 | 36.0 | 31.0 | 6.7 | 14.5 | 80.9 | 45.7 | 33.1 | 57.4 | 1.3 | 43.9 | 59.1 | 89.6 | 10.7 | 11.0 |
| **Herrera** | | | | | | | | | | | | | | | | | |
| Las Minas | 7,100 | 90.8 | 0.3 | 20.7 | 40.8 | 62.4 | 8.9 | 95.7 | 87.0 | 77.8 | 87.8 | 0.0 | 68.6 | 86.6 | 93.1 | 5.3 | 1.0 |
| Los Pozos | 8,740 | 93.2 | 0.9 | 31.7 | 25.3 | 41.8 | 8.8 | 96.8 | 89.3 | 73.5 | 90.2 | 0.0 | 64.2 | 86.6 | 87.9 | 9.7 | 1.7 |
| **Los Santos** | | | | | | | | | | | | | | | | | |
| Tonosí | 12,790 | 91.6 | 2.8 | 36.3 | 19.4 | 29.1 | 4.5 | 95.9 | 79.7 | 73.6 | 80.6 | 0.8 | 52.8 | 83.9 | 72.4 | 25.3 | 4.3 |

**Source:** CDSS 1981 - 1985, USAID/Panama

The zone displays wide variations in elevation, from 350 feet above sea level to altitudes over 7,000 feet, with the Guaymí living at altitudes of up to 5,000 feet. Less than one-half of the comarca land is arable utilizing techniques that the Guaymí currently possess, and this land, mostly thin laterite with patches of volcanic soils, is agriculturally classified as 'severly or very severly limited' by the Ministry of Agriculture. Population density varies between three and 36 people per square mile, with an average of approximately 14 persons/mi.$^2$. Despite this dispersion, which is adaptive to ecological conditions and the technological demands of slash-and-burn agriculture, the small groups of scattered Guaymí are made effectively more cohesive through the influence of kinship relationships and traditional communications patterns. To the Guaymí, the existence of kinship ties far outweighs physical location or aggregation in determining community. Thus a house or group of houses located at a distance of several miles from a population cluster (community in the Latino sense) would be considered an integral part of that community if close consanguineous ties existed among occupants of those houses.

The residential nuclei that do exist are generally composed of two to six houses occupied by one kinship group of consanguineously-related males, plus in-married females and unmarried children. Recently, because of increasing population pressure on a reduced arable land base, in some places several kinship groups have been forced to reside in close physical proximity. Where these more dense groupings, usually 10 to 15 houses containing from 50 to 85 people, occur, Latinos and other non-Guaymi have given the population clusters place names and community status.

The Guaymí, like many of the Latinos in these poorest provinces, have been caught up not only in the problems of land scarcity but in changes in the economic structure of western Panama (the completion of the Pan-American HIghway and increased opportunities for seasonal paid agricultural employment); like the Latinos, male Guaymí migrate temporarily as work is available, leaving to women much of the subsistence agricultural activity at home and correspondingly changing traditional patterns in division of labor. This movement into the market economy, albeit marginal, in addition to geographical factors, have brought about more contact between the Guaymí and Latino populations in Veraguas than in the 'purer' Indian regions of Chiriquí and Bocas del Toro. Nonetheless, there remain important differences in self-image and community relationships between the two groups which appear to matter very much in the delivery of services and the transfer of technology.

# METHODOLOGY

As a basis for the Social Soundness Analysis, 15 fishpond sites in 7 districts (41% of the 17 districts in which DINAAC has proyects) were visited. These were, by district: San Francisco (Lagartero, La Mona, La Perdíz), Santa Fé (Paja Peluda), Las Palmas (Buenos Aires/Roble), Chumico, Cucurucha), Olá/Coclé (Las Huacas del Quije, Hijo de Dios), Cañazas (Palo Verde), Santiago, (Paso Las Tablas, Coloncito, Canto del Llano, La Normal), and Atalaya (Instituto Jesus Nazareno). Four sites, those in Las Palmas, are self and other identified as 'Indígena', lying within the admittedly vague boundaries of the Guaymí comarca. The rest were essentially Latino.

The sites visited ranged in accessibility, which was one of the criteria for site selection, as follows:

1. Easy Access (close to Santiago, paved road): La Normal, Canto del Llano, Coloncito, Atalaya, Paso Las Tablas.

2. Easy Access, More Distant (farther from Santiago, but paved road): Palo Verde 1/ Lagartero, La Mona.

3. Relatively Easy Access (more distant, some unpaved road): La Perdíz.

4. Difficult Access (distant, some paved road, plus long stretch poor, unpaved road): Buenos Aires/Roble, Chumico, Cucurucha, Paja Peluda 2/.

1/ Palo Verde itself is of easy access. However, it was visited to take advantage of a meeting of three communities, two of which (Las Huacas and Agua Amarilla) are at some distance by foot.

2/ While this site is not too distant from Santiago and road is paved, the last stretch involves a considerable walk and a river crossing by means of a long, swaying footbridge of dubious reliability.

5. Extremely Difficult Access (distant, some paved road, plus very long stretch unpaved, terrible road): Las Huacas del Quije, Hijo de Dios.

In addition to the criterion of accessibility, sites were selected so that all the following variables would be covered; mode of construction (hand-dug/machine-dug, which correlated roughly with small and large size); ethnic group (Indian/Latino); harvesting method (continuous/non-continuous); and level of integration (fish only/ fish plus animals/fish plus animals plus gardens). Also included were ponds which were effectively at demonstration sites, such as ciclos básicos and agricultural schools, as well as privately-owned ponds. The sample was small, purposive, and utterly non-random in the statistical sense.

The original research design contemplated interviewing, at varying length, three community members in each site with community ponds: a project leader; a project member, preferably female; and a non-member. However, limitations of time and distance, in addition to the absence of a number of males due to the demands of the cash-crop harvest season, made that plan unworkable. Thus those interviewed varied from site to site, and included members and leaders of community groups responsible for fish-pond projects; ciclo básico and agricultural institute directors, managers, and laborers; private pond owners, and DINAAC personnel.

The semi-structured interview schedule included: basic community data; production and consumption patterns; project history, characteristics,

experience, and management; community organization and participation; role of service agencies, particularly DINAAC; involvement of women; economic aspects; spread effect; problems; and future hopes and plans. Table 4 lists the sites visited by district, ethnicity, number of ponds, area in $m^2$, DINAAC classification, ownership, and level of integration.

## SITE CHARACTERISTICS

The topography of almost all sites, except for those near Santiago where the land is flatter, can best be described as ranging from somewhat to extremely broken, settlements were in general of disperesed type or with some nucleation with a dispersed population tied by a variety of linkages to that nucleus, size of settlements with ponds (again excluding sites nearest to Santiago) ranged from extended family groupings as small as four households (eg., Paja Peluda) to as large as 80 households (e.g., Las Huacas del Quije).

Access to services was largely a function of distance. The most distant sites had a health post with an auxiliary nurse, but were essentially without care for grave illnesses or emergencies. Most sites had relatively easy access to a primary school, but little beyond that. Buenos Aires had a ciclo basico (junior high school) with an overburdened boarding capacity which drew on a number of extremely remote areas for its population. Except for Santiago and nearby paved-road sites, availability of markets was virtually nil. The majority of settlements with any nucleation had

potable water, but about one-third were dependent on natural water sources and carrying. In all sites, the majority of dwellings were said to have latrines, but several respondents indicated that 'having' did not necessarily mean 'using.' Finally, almost none of the sites had a usable community center and employed the local primary school as the most customary meeting place.

Landholding was a disconcerting mix of bits of land owned (terreno/parcela propio/a) or loaned (prestado), or land without formal title but used as if belonging to the individual or community (derecho de possessión sin titulo se considera de ello/s, cercado sin titulo). Almost invariably, the available land was seen as inadequate in terms of size, distance, dispersion and, principally, quality. There is, in effect, little faith in the land's capacity to produce sufficiently, especially without fertilizer or irrigation, a perception which could impinge on the potential success of MIDA/DINAAC to promote gardens as integrated fish-pond components.

The crops grown on this disappointing land were standard for the area: rice, corn, cane, yucca, and some beans, mainly frijol de palo, with some minor cultivation of sorghum and millet and seasonal availability in some areas of indigenous fruit. While almost all sites had at some point tried growing some vegetables (including peppers, tomatoes, cabbage, stringbeans, carrots, onions, chayote, and cucumber), few offered evidence of major success or any notable cash profit. Yet over half were disposed to try again and some were in various stages of seedbed preparation.

Without exception (schools and private Santiago pond owners excluded), meat was rarely consumed for lack of cash and availability ("cuando hay plata, no hay carne, y cuando hay carne, no hay plata"). Fish consumption was similarly rare except for an occasional river catch, cheese was unknown, and beans (porotos) increasingly infrequent although they are valued as the poor man's meat ("gallina rosada"). Individual livestock holdings, other than the asentamiento cattle projects in the comarca financed by the Banco de Desarrollo Agropecuario and the DINAAC/Ministry of Health pig projects, are few and limited to an occasional cow, a couple of pigs, and ubiquitous but not regularly consumed chickens. About half the sites had had some experience with various supplementary feeding programs which were generally appreciated, with scattered complaints about random inustices.1/

1/ For more detailed data on consumption patterns in the fishpond areas, based on 24-hour recall investigation, see Annex _____, J. McGuire, NUTRITION RECONNAISSANCE AND EVALUATION MODEL, MANAGED FISH PRODUCTION PROJECT DEVELOPMENT, USAID/PANAMA, December 11, 1979.

## THE FORMATION PROCESS

While there has been considerable variation in the details of how community fishponds have gotten started, there are some instructive consistencies which correlate roughly with the relative success of such projects. 'Success' is defined for purposes of this analysis as subsuming: continuation of project, amplification of project (e.g., expansion of pond, addition of another component such as pigs and/or gardens), and spread effect which, in turn, subsumes replication in the same community and/or in other, usually neighboring communities.

Factors or conditions which appear to favor such success are:

1) The positive effect and response to DINAAC promotion via radio, through the daily messages of Doña Duva, La Cholita del Tute, a quasi-campesina persona whose style and enthusiasm seem to strike a responsive chord in the transmission area.

2) Hearing about a nearby pond, going to see it and, most importantly, purchasing some of the catch.

3) An ongoing relationship with an active promoter of a governmental or private voluntary organization, e.g., Caritas, together with some previous community activity.

4) An extended-family settlement base. Private pond-building seems to be generated more by higher income levels, the elusive quality of entrepreneurship, and frequently, contact with the DINAAC director.

Factors which appear to conspire against success are:

1) Top-down, paternalistic promotional style.

2) Larger community size.

3) Very large pond size, machine-dug.

of these, only the first is sufficient in itself to reduce chances of success; however, in unison they almost guarantee what can fairly be termed 'failure.' 'Failure' is, obviously, the opposite of what has been defined above as 'success.' What is interesting is that communities do not seem, as a rule and for the present, to view technological problems as failures. Floods that wash out earthworks so that fish end up in the river, ponds that dry up or whose water level diminishes importantly in the dry season, small catches, or small-size fish, do not in themselves deter a committed community from continuing with the project. Perhaps because the technology of fishponds is relatively simple from the campesino perspective, such breakdowns are seen as temporary and reparable.

Furthermore, no matter what the size of the project, fishponds qua fishponds are not seen as a primarily economic activity and, even in communities which are now paying for fishfeed and the fingerlings initially provided gratis, the investment is not usually a large one. The principal perception of the fishpond activity is, consistently, that its main value is nutritional; to a standard diet that is poor in quantity and quality, a fishpond project adds, less frequently than is desired, an appreciated component. In fact, the valuing and enjoyment of fish as a food is another

though not sufficient, factor in project success. While infrequently consumed heretofore, campesinos like fish and, with one exception, feed it to their children from the age at which any solids are added to infant diet, with the bones carefully pulled out ("se pulga el pescado"). Fish is stewed, with or without vegetables; made into soup; roasted; dried, smoked, and salted; and, when oil is available, fried, the preferred preparation particularly for tiny fish which are then consumed whole, with perhaps some extra mineral benefits. Surprisingly, smaller fish are seen as offering a certain advantage, since they can be more easily distributed among family members. The feeling about fish was that any size was fine ("no importa; como venga") and only one respondent found larger fish were more attractive from a sales standpoint. Thus the whole issue of acceptability of fish to the target population is a non-issue, a red herring, if you like.

## COMMUNITY PARTICIPATION AND THE DIVISION OF LABOR

Participation rates in fishpond projects, their formation, construction, maintenance, and expansion, ranged from 0% to 100% of the populations in the communities visited. In the main, projects which had been more or less imposed and were managed principally by government institutions or their representatives had zero to low participation rates (e.g., Las Huacas del Quije, Hijo de Rios, Roble). Projects which had arisen through a spontaneous community desire for a pond had the highest participation rates and fewer obvious organizational and collaborative problems (e.g., Lagartero, La Mona, Paja Peluda). Somewhere in the middle range were projects which had received what was referred to at one point as "helicopter" promotion but which involved communities small and concentrated enough so that it was possible for DINAAC to help them through what in some cases evolved into real social and technological stress (e.g., Chumico, Cucurucha). For self-starting communities, the accessibility factor did not seem to weight heavily; communities which were not self-starters gave evidence of suffering more from any lack of frequent contact with extensionists and the supply of inputs. Sheer geographical distance and difficulty of access seem to weigh more heavily than any other single factor, such as ethnicity or mode of formation, in the steadiness and success of projects, but problems with the latter factors were not helped by inaccessibility.

One element that might have been expected to be a problem was the availability of pond land in areas already identified as land-poor. Nevertheless, the acquisition of appropriate land was, in none of the sites seen, an issue. The necessary parcel was either community, private or national land which was donated for the fishpond project. This process may have been facilitated in some instances by community spirit and agreement on the desirability of pond. However, it is also likely, as the majority of respondents indicated, that the land was already some sort of natural water catchment of untillable slope and inappropriate for other agricultural purposes. Thus marginal or unusable land was reclaimed by the fishpond project, an undeniable benefit. Unfortunately, no data were gathered on any legal or quasi-legal transactions which might have been involved. Still, there is ample history in development annals on the fate of small-farmer projects which upgrade land and then are usurped or coopted by larger farmers, a history which suggests that the Project follow the practice adopted for SDA fishpond activities which require official title transfer for lands so used.

A number of questions were raised in the cable on the DAEC review of the fish production PID concerning the community organizational base for the project. In the sample of sites visited, no clear picture emerged of any single community group that might serve as a consistent nucleus for the establishment of demonstration and new fishpond sites. All of the communities visited already had had some sort of community organization

prior to the fishpond project. Such organizations included: health committeess (Comités de Salud), parent-teacher groups (Padres de Familia), community development groups (Grupos Comunales), CARITAS agricultural groups (Grupo Arado), cooperating kinship groups, and locally-selected, quasi-political governing bodies (juntas locales). Fishpond committees were in some cases coterminous with one of these groups, depending on the size and organization of the community, or draw part of their membership from such groups. All of the communities had had some experience with some sort of community enterprise, including road improvement, small livestock and garden projects, latrinization campaigns, school and community center construction and, for the asentamiento agglomerations, cattle-raising. It would seem that, while it may be important to project success for a community to have had some experience with group formation, no particular group type prevails nor is any one type more suitable by definition. Furthermore, while in the smallest settlements things go more smoothly if everyone, or almost everyone, participates in the work of the pond, communities seem to be able to manage with only partial participation, at least at the outset. This is especially true if the project is very small, if it is kinship-based, if it is selling fish at a higher price to non-members than it does to itself, and if the pond project is "fish only." The maintenance and harvesting demands of a simple fish pond are not seen as excessive, at most 15 minutes to a half-hour per day, and thus non-membership is a slight economic plus. Nevertheless,

as projects become more complex and labor demands greater, smaller populations evidence correspondingly greater need for more hands and fuller participation, primarily at peak periods of labor demand on or off-farm, and chafe more obviously when that is not forthcoming. It is at this point that community motivation and organization is crucial and where the skill of the promotor or extensionist is tested.

The institutional and community division of labor required by fishponds and any additional components is presented, for purposes of succintness and clarity, in tabular form (see Table 5). It becomes clear that women have a major role in fishpond projects from the outset. In a number of communities women have, in fact, been the prime movers in such projects and, at least in Latino areas, are active in project-related community meetings. This is less the case in indigenous areas where, although women increasingly participate in agricultural labor, they do not yet function actively in the community decision-making processes.

Despite the pressures toward off-farm labor and the larger labor demands of more complex pond types, there are traditions of mutual labor in Panamanin rural society which can and do serve as a base for fulfilling fishpond work requirements. Young (op.cit.) found among the Guaymi that, although much of thw work in indigenous communities was performed by households acting as independent economic units, certain tasks are customarily accomplish through the cooperation of kinsmen residing in different households and communities, as well as by non-kin groups. Festive labor,

incurring little obligation by participating parties to repay labor invested, usually involves persons not related to one another. A subcategory of such labor, general festive labor, comprises activities based on mutual recognition of needs of a particular geographical areas (e.g., clearing a trail of building a school and involves the formation of a leaderless work group composed of all members of the area regardless of kinship affiliation, each member providing his or her own food. "Private" festive labor, related to activities which will benefit one individual, family, or kinship groups (e.g., house building) is organized by a leader or '*patron*' who supplies food and drink to those who assist; there is no formal obligation to repay such labor.

The second major labor form is exchange labor, which customarily involves individuals with kinship ties, incurs a strong obligation to reciprocate, and is most common during land-clearing and harvest periods. The *patron* usually invites people of his kinship group to participate in exchange labor activities, asking as many people as he can reasonably repay in kind without jeopardizing the economic security of his own household. He provides food and drink, the latter a particularly strong incentive to participation. When the task is complete, the *patron* will then owe an equal period of labor, usually one day, to each participant other than members of his own and his wife's households. Mutual labor forms are also found, to varying degree, in many rural Latino communities and are customarily referred to as participating in a *junta* (not to be confused with the *junta local*) or as *haciendo peon* (doing day labor).

The predominant form adopted for fishpond construction would fall under the rubric 'general festive labor.' The routine work of fishpond maintenance, however, has no indigenous parallel and is organized by whatever group happens to make up the fishpond committee or by its leader(s). The recurring, regularized, communal labor obligations involved in fishpond maintenance thus corresponds to no identified "natural" model, which may explain any difficulties encountered in establishing routines in non-kin-based communities which do not have more or less continuous fish harvesting as a persistent incentive.

Unfortunately, there is a sort of continuous harvesting that does act as another kind of incentive, that is, theft, colloquially termed '*la mano negra*.' About one-third of the communities reported poaching but, except for one group which had confronted the issue in open community meeting, none had taken any strong measures to address the problem. DINAAC representatives reported that some other communities had dealt with the dilemma by arranging to have a community member sleep near the pond. However, none of the communities had found a way to deal with what, for some, was the biggest predator of all, *Martin Pescador*, a fish-loving and adept bird. No reliable estimates were available on the dimensions of loss from either invader.

## The Role of the Private Sector

Individual entrepreneurs have been quick to take a try at fish-raising, the large majority on a small scale for private use and for distribution to

friends, neighbors, and workers. The smaller operations have been effective in generating an important amount of replication, not just by individuals but by community groups as well, whom some private entrepreneurs have helped with their own acquired technical capacity or at least with the lessons of experience.

Beyond this, there has been an exchange of technical expertise and support between some private-sector commercial fish production entitites and DINAAC which has redounded to the benefit of both, although there is some question as to who has benefitted most. The ingenio tractor-for-labor arrangement constitutes another private sector contribution. Finally, until recently, poultry producers were giving away chicken litter (gallinaza) to be used for fish feed to whomever would carry it away. At least one producer has begun charging for this hitherto waste product, bringing into question the DINAAC supposition that rice-processers, for whom rice hulls present a major disposal problem (the estimated removal costs for Panama's 40 rice mills is approximately $250,000 yearly), would be disposed to give it away to communities. It might be well for DINAAC to begin at once to formalize some contracts with major rice and poultry producers which would assure no cost to the institution at the very least and perhaps even some cut-rate reimbursement for the favor of the haulage.

## THE ISSUE OF EXTENSION

It also becomes clear in Table 5 that although outside institutions, especially DINAAC, have major and continuing responsibilities to fishpond projects as they are now constituted, responsibilities which increase as projects become more complex and entail ever-greater financial outputs, community contributions are substantial. However, the community input is primarily labor, and the weight of the financial burden continues to be borne by DINAAC, which also bears the load of timeliness and complexity of inputs, despite limited manpower, vehicles, and constraints on access.

As will have been observed elsewhere in this document, both DINAAC and MIDA suffer from serious limitations on their outreach capacity. The recent decentralization of DINAAC into regional MIDA offices is theoretically defensible, because it responds to current thinking about best rural development approaches, and pragmatically defensible because it should reduce the overload on DINAAC. This may be so, but the present picture is that both entities suffer from lack of vehicles, manpower, equipment, and adequate extension training. DINAAC, as a semi-autonomous instituion, had a certain élan and mystique under the aegis of a dynamic, technically competent, and committed director which has been crucial in generating the fervor for fishponds. Unless appropriate cross-training occurs in both pisciculture and extension/community development, the momentum so quickly achieved could be ground down to a halt by the MIDA apparatus and variable commitment.

MIDA research and extension service has not, in recent years, been reaching most private producers, nor has it been very effective with its principal charge since the early 1970's, the 200 asentamientos which rely on it for help with titling, credit, technical assistance and other services. The loss of direct control by DINAAC also exacerbates what was already a problem when it was an independent entity, that is, supervision: the orderly and consistent vigilance which impedes the growth of bad extension practices. Clients are aware of such practices and perceive them clearly as breakdowns in the delivery and supervisory systems. Inputs for special programs -- seeds, fertilizers, insecticides -- do not arrive on time; reseeding of ponds is slow, though improving; in some areas, communities are not advised about harvesting so that all interested members may be present; pig feed arrives late, or arrives frequently enough but the MIDA extension agent ignores the fishponds; nets are loaned and not returned and are insufficient in number in any event, so harvest may be delayed; small livestock projects are prefaced by insufficient campesino/a training and followed by failure and financial loss; the full implications of a given project, especially credit and money management aspects, are poorly explained to and understood by campesino groups, resulting in loss, disappointment and, in one case identified, outright fraud.

In all fairness, both entities are without an adequate number of safe and appropriate vehicles to carryout their various duties. The problem is exacerbated by lack of scheduling and rationalized "circuit-riding" which would partially alleviate the insufficiency of numbers and conserve time

and fuel. The constant flow of visitors and consultants through DINAAC, sometimes unscheduled and unbidden, further drains limited capacity.

Because there is a large volume of requests for fishponds -- DINAAC indicates almost 50 to 100 outstanding -- promotion activities by extensionists can be limited for the near future and may be largely covered by radio and natural multiplier effect. Communities seem to be able to get themselves started and maintain a pond that does not have major technological flaws. Nevertheless, as projects add components, become more complex, and move toward the stated goals of full integration and self-sufficiency, the need for extensionists who are committed to such projects, are technologically multi-skilled and who are trained to competence in the various aspects of community development, will be acute, Community gardens, because they have not been eminently successful in the project area in the past, may be the most difficult to accomplish; there is still a residual unwillingness among older farmers to dedicate any arable land to crops that are not "real" food, i.e., grains and tubers, and one might anticipate resistance to any efforts at turning major plots into grass-land to support large stocks of hervivorous fish unless the land concerned were unsuitable for any alternative use. At least in the indigenous area, there is evidence of some question about what a vegetable <u>is</u>: plantain, yucca, and otoe, for instance, were sometimes identified as vegetables. An extensionist may have to begin at a very basic level or plan to add the most culturally acceptable and vitamin-rich garden produce to a base of traditional plantings, rather than attempt to diversify cropping at one fell swoop.

## COMMUNITY DEVELOPMENT

There are three major community development issues, which are, of course, the other side of the extension coin: leader selection; understandings of the implications, positive and negative, of the cooperative mode of organization; and institutional weaning.

### Leader Selection

At present, there are no standardized criteria or any established *modus operandi* in DINAAC for leader selection; the methods now used are idiosyncratic, personalistic, *ad hoc*, and, markedly in indigenous sites, culturally inappropriate. In one community meeting, where almost 60 people from three communities appeared on a Friday morning to follow up on their request for fishponds, an attempt was made at organizing a single directive for three quite separated communities; the attempt failed. The voting and nomination process for a representative from each community which followed, was carried out literally on command; a simultaneous secret ballot produced only a single mention of one name elicited on the floor in theoretically open forum, suggesting that at least some leaders named do not reflect true community preferences. Young (*op.cit.*) analyzes at length the Guaymi group meeting (*congreso*) and decision-making process, the principal characteristics of which are lack of direct assessment of opinion through open voting, no vocal disagreement and avoidance of overt verbal confrontations in large meetings, and the passage of some time between such forums, during which gentle lobbying by proponents of issues occurs and leaders attempt to identify the majority position. Even in Latino culture, open rejection of

a candidate or overt statements often produce cultural discomfiture. Furthermore, in Guaymi areas, a careful balance must be maintained among the three power groups -- traditional chiefs (caciques), elected representatives (representantes), and kinship groups. Thus, extensionists must be educated not only to the sheer existence of the cultural factors involved, but to practical techniques for dealing with these in a way that is more likely to produce a durable community apparatus.

Cooperative Organization

Pollnac and Ruiz-Stout 1/ studying marine fishermen in Panama, found a great deal of variability in knowledge concerning the role and total meaning of the cooperative, variability which led to problems in instituting and maintaining this form of organization due to differing expectations among participants.

As indicated above, a good number of communities can manage the construction and maintenance of a simple fishpond in a cooperative way. Yet, for now, all of the projects seen which have added another component to basic fish polyculture have either:

1) had a continuing managerial presence that was not really an integral part of the community (e.g., Buenos Aires/Ciclo Básico staff and students; Las Huacas del Quije/RENARE and MIDA staff; and, to some extent, Chumico)

2) was part of an institution (e.g., La Normal, Instituto Jesus Nazareno)

1/ R.B. Pollnac and R. Ruiz-Stout. "Perceptions of Fishermen's cooperatives by small-scale fishermen in the Republic of Panama." ANTHROPOLOGY WORKING PAPER No.7, Sociology-Anthropology Department, University of Rhode Island. 1976.

3) was privately owned (e.g., Canto del Llano, Coloncito)

or

4) had had problems (e.g., Roble Chumico, Cucurucha).

There is testimony that communities, with patient and persistent understanding, can be helped through the process of moving to more complex levels of integration and necessarily more elaborate cooperative forms (e.g., Cucurucha). DINAAC has recently tried two different models, not mutually exclusive, for addressing this issue: the first was the hiring of an indigenous technician to provide assistance and supervision in the Guaymi area. The experiment failed in such a way that it is difficult to determine whether the crux was the salary/envy issue, personality factors, or the idea itself. Because the second factor was so obviously at play, exacerbating the weight of the first, and because the idea seems on its face to be sound, DINAAC should try it again. Experience with the pilot Plan Guaymi has shown that unsalaried trained promoters do engage on their own, without outside assistance, in such activities as latrine-building and adult literacy. Because they must continue to support their own domestic units, they can only work part-time so that, although the promoter concept is feasible, it is limited, and some sort of monetary reward would be needed for a fuller commitment of time. Given the limits inherent in extension capability, two type of local-level workers may be needed: one a volunteer at a leadership level, with enough technical training to permit intelligent promotion and basic maintenance; another for more skilled assistance, e.g., horticulture, tilapia-sexing, and small-animal production (e.g., disease surveillance and injections).

The second experimental model was giving a community (San Bartolo) a course in cooperativism at the onset of the project. Since this community has just begun pond excavation, any judgment would be premature. In any case, the acid test appears to be an increase in project complexity. Cooperative motivation and training would therefore best be phased, with increments as appropriate which would deal with possible structures for economic and legal strengthening of groups, the potential and management of credit, decision-making processes, and so forth. A most important component of such training would be basic education in financial management, beginning with the simplest formula for feed: fish, sale price, profit, breaking even, and loss. Through a process of trial and error, a number of communities are learning at what price they can and must sell their fish. However, in none of the communities which had fish ponds/plus pigs were the members interviewed knowledgeable about the dimensions of the investment and profits that might be expected. Such data were in the hands essentially outside managers such as the extension agent, the ciclo básico director, or the cacique. The member stance with regard to profit or loss was, "We'll find out when all the pigs are sold." Certainly, the element of uncertainty is inherent in any business venture and experiential learning is a valid tool, but education to cooperativism should include some concepts of what reasonable, course-grained economic expectations might be. In the most fully integrated projects visited, both fish and garden produce were distributed gratis to the community, usually in return for labor; if such

projects were to shift to some cash payment for these items, the needed calculations would be even more complex and would require still greater educational activity. Even in the simplest projects, fish only, communities should understand the appropriate sale price for their excess production, i.e., a level within the reach of the consumer population which covers feed and fingerling costs and which is not so high as to depress consumption in search of financial gain.

Institutional Weaning

DINAAC is well aware of the dependency problem. At the same time, the achievement of a rapid spread and demonstration effect almost demanded a quasi-dictatorial and paternalistic first stage. DINAAC has already, as noted, decentralized itself into the MIDA regional offices, although this means only that dependency on outside agents for inputs, technical assistance, and marketing is transferred, not eliminated The dependency cycle is hard to break for two reasons: 1) there is a well-documented heritage in Panama, as in the rest of Latin America, of patron-client relationships, reinforced by the impermeability of social and economic structures to substantive change and lack of control by campesinos of the factors of production. Campesinos cannot yet breed their own piglets or fingerlings; do not own trucks to receive inputs or market production, and are further constrained by poor or non-existent access roads; and cannot otherwise get credit.

These are the facts of rural economic life. For the foreseeable future, transport and credit will be out of the campesino's reach unless DINAAC/MIDA

and the MSP provide it; it would probably be well for AID to accept this reality and help DINAAC/MIDA to address it effectively and to devise ways for campesinos to absorb in some token way the related costs as projects mature, in order to gradually equalize the donor/recipient ratio. As for credit, to date DINAAC reports extremely low default rates in its informal credit system; as long as this continues, MIDA is disposed to continue to back the revolving fund, and the MSP pig project goes on, there may be no better way of providing small, soft loans to get projects started. If default rates were to rise, that would be another story. Lovshin 1/ has suggested that a slight management charge be added to any loans and, indeed, the rural development experience has been that, in some contexts, low-interest loans are counterproductive. DINAAC could experiment with a tiny handling charge on loans to communities with longer project experience.

There are other micro-strategies which DINAAC could try out and, in fact, is already contemplating, such as some tariff per dressed-pound for pig transport, or a small increment per bag of fingerlings, similarly for transport. DINAAC should seek a more favorable price for commercial fish-feed from the producer to permit itself some profit margin without raising the price of feed to campesinos.

1/ L. Lovshin. FISH CULTURE DEVELOPMENT PROJECT FOR PANAMA. USAID/PANAMA and Auburn University. January 30, 1980.

## SPREAD EFFECT AND BENEFIT INCIDENCE

In sheer numerical terms, there is, as observed at the outset, little question about the spread of fishponds, from zero in 1976, to 73 at end August 1978 1/ to 192 by September 1979. During 1979 the number of beneficiaries was estimated at 7,562 persons who consumed 132,564 pounds of fish, or 17.5 pounds per capita, an average of one and one-half pound per month.

While an unknown proportion of this spread derives from DINAAC promotion, there is unassailable evidence of spontaneous multiplier effect. In its earliest phases, fishpond project activity responds to the three aspects Pollnac (op.cit.) cites as highly correlated with adoption of innovation; perceived complexity (fish culture is not now seen as complex); perceived trial-ability (the costs of obtaining a fishpond and its relative availability are not now seen as prohibitive, an argument for the DINAAC strategy of front-end loading); and perceived observability (a quantitative appraisal of the advantages of fishponds are possible with only casual observation). These factors explain the high rate of spontaneous requests for ponds (outstanding because of current limitations on DINAAC's capacity for response), and the occurrence in some areas of a natural satellite effect, of which the San Francisco, Santa Fé, and Cañazas sites provide ample testimony, if different in their manifestations. The first group -- Lagartero, La Mona, La Perdíz, and San Juan, plus a number of private ponds -- though variously motivated, have provided one another with a reinforcing effect and have generated purchases and interest in nearby

1/ R.O. Smitherman. EVALUATION OF THE PANAMA AQUACULTURE PROGRAM. Auburn Alabama: International Center for Aquaculture, Auburn University. September 2, 1978.

communities (e.g., El Gato, Gatú, San Francisco, Caravalí). The second group began with purchase at Las Quebradas and expanded to several ponds per community at Paja Peluda, Los Corotues, and La Montañuela, which have devised their own, if imperfectly systematized, rotation of harvests to permit purchase from one another at different times, thus increasing frequency and regularity of fish consumption. The final case spun off from the combined demonstration effect of the Cañazas ciclo básico pond and some small private-pond construction and elicited a joint request for ponds from three neighboring communities, Palo Verde, Las Huacas, and Agua Amarilla. Both "natural" and planned demonstration projects, then, can produce a multiplier effect; among the latter, the smaller-scale projects which entail come community participation appear to evoke more attempts at replication.

Because DINAAC has just begun to maintain records on harvests and community populations, it is impossible to calculate the probable consumption impact in any given nucleus; until such data are compiled on a regular basis, the global production and beneficiary population figures must suffice. And, since no economic data are accumulated by most communities, it is not possible to calculate the economic impact of projects in terms of either per capita cash income or imputed value of fish consumed, or to do even the most basic cost analysis. This makes it difficult to make anything more than an intuitive judgment about impact at the community level or to make decisions about which technological mixes are most effective economically and nutri-

tionally in practice. DINAAC has been able to refine its technological data base and calculations such as pound-of-fish produced: feed mix, but this has not been costed out by individual project so that relative success can be appraised.

There are other practical, technological, economic issues that DINAAC also must confront. To produce one pound of fish, 1.3 to 1.5 pounds of commercial fishfeed at $.14 per pound (plus any cost of fingerlings) are needed, a ratio which can be improved to 1.1 with the addition of carp and grass. For some communities, this cost has apparently been prohibitive; their purchases of feed occur in small, erratic amounts, which is logistically messy and results in low harvest yields.

The impact of pig projects is somewhat easier to assess, because records are maintained by "outside" managers in a more formal fashion than that characterizing fish production. The community of Chumico, as one example, had realized a net of B/416 from its first sale of pigs, which it used to buy more pigs. Since the community had begun breeding its own piglets, it is reasonable to expect that the next production cycle would increase this net and permit some distribution of profits to project members (N = 14 households or, based on current net of B/416, close to B/30.00 per household in an area where the average family income does not normally exceed B/130.00 per annum). This community was also giving fish and garden products to members in return for project labor, another benefit but an unquantified one.

Evaluation of impact presents the project with a dilemma. In order to do any valid measurement, DINAAC/MIDA must keep or get careful records of amounts and costs of inputs per community, income from sales, yields, etc. With continuous harvesting, a primary technological goal, this will be harder to do and, indeed, even with quarterly harvesting it is hard enough. And, the very informal and community-participatory style which now characterizes numerous projects and represents one of the program's strengths, militates against more rigorous record-keeping. DINAAC will have to find a way of refining such activity without undue rigidity and without encouraging local-level petty dictatorship, perhaps as part of any promoter/leader/paraprofessional training. The intricacies of impact assessment will grow as individual projects accrue to themselves new, directly or indirectly related subprojects; about one-third of the communities visited, primarily those who had been self-starters, were beginning other projects -- more pond construction, pig projects, gardens, bee-raising, dam-building, and chicken and duck projects. An argument can be made either for a very simple evaluation indicators or some very elaborate ones; given the dimensions of the project, the former seems best suited. A combination of simple consumption indicators and some cast studies of development path analysis and community participation in different project types selected according to criteria of accessibility, ethnicity, and age and origin of project might be sufficient.

The issue of nutritional impact is addressed elsewhere in this document: McGuire (op.cit.) concludes, examining alternative forms of measurement, that the best single indicator is consumption of protein (fish plus meat) and vegetables. Such analysis should be disaggregated to assess

differential effects on mothers and children in key age cohorts. This research and McGuire's show that all family members, including children under age 1, eat fish, but this should be measured. Even considering that the project starts with a base of close to zero consumption of these items, at present the system of harvesting every three months, together with small pond size and some low yields, puts a ceiling on the consumption potential. DINAAC is well aware of this limitation, as are affected communities, who devise their own methods for raising consumption, e.g., poaching on own or other's pond, fishing more frequently than recommended, building more ponds, rotating harvests among neighboring communities, and eating the non-fertile tilapia hybrid fry. The resolution of this problem is largely a technical one and is discussed in the Technical Analysis. Because there is already awareness at the community level of this boundary and because taste and interest have both been aroused, a lack of resolution at the technical level could in itself constrain the endurance of the project.

SUMMARY OF ISSUES AND FINDINGS ..... STRATEGIES AND RECOMMENDATIONS

The following summary of issues and findings, with accompanying suggestions for strategies and some general recommendations, includes some concepts DINAAC has already addressed itself to and which are already included in current plans. Others are items already discussed, by this author among others, with DINAAC staff and which have their concurrence. The final group emerged in the writing of this report.

SUMMARY OF ISSUES AND FINDINGS ..... STRATEGIES AND RECOMMENDATIONS

Dependency

Recognized as a problem by DINAAC, which has decentralized. However, dependency only transferred, partly, to MIDA. At the same time, only these entities and the MSP can offer transport of inputs, marketing, easy credit, and technical assistance.

- While there can and should be no return from decentralization, DINAAC should not be allowed to lose technical control of the program. Project support should reduce risk of that occurring.
- AID must accept fact that, at least until projects mature and community clusters can raise their own fingerlings and piglets, dependency will be a rural fact of life, diminishing if certain strategies are adopted to accomplish this. As campesinos can earn enough to pay for part of these services, dependency should become less of an issue.

- Among possible strategies are the following technological and economic solutions:

  ° Reduced reliance on manufactured feed, using wastes (e.g., rice hulls), manures, foliage, and grasses.

  ° Continuous harvesting, acceptance of lower yields in exchange for greater frequency, less dependency on DINAAC for help with large harvests.

  ° Provision to each community of own small net, cost of which can be amortized with payment for fingerlings. Promotion of net-making artesan industry in Guaymí area where skill already exists, to reduce costs.

  ° Assuming success with first seeding, payment for subsequent batches of fingerlings.

  ° Small tariff per dressed-pound-sold for transportation provided by DINAAC/MIDA/MSP, increasing gradually as communities begin production own piglets.

  ° Establishing hatcheries in sites strategic for communities. Will involve training for selected community workers.

  ° Teach management of ponds stocked with male and female tilapia.

Expansion

Concern about DINAAC capacity for and implications of too rapid, haphazard expansion. Issues of quantity vs. quality, expansion vs. consolidation.

- Expansion should subsume both consolidation and gradual extension to other areas, and should be phased to accord with available manpower and logistical support. A plausible schema might be:

° A consolidation and "polishing" in area of earliest and greatest activity, Veraguas, which now has 85% of all projects, building demonstration sites in incremental fashion in communities which have displayed spontaneous initiative in pond construction and subsequent search for add-on projects.

° Limit expansion to areas roughly equidistant from Santiago/Divisa, beginning with recapturing and linking up of projects in Cocle, which has 77% of current projects outside Veraguas, perhaps tying sequence to labor-intensive road construction under AID loan. Concentrate on districts with highest indices of poverty and malnutrition.

° Leave promotion in indigenous areas of Veraguas and expansion into Chiriqui to Guaymi promoters, taking advantage of funds available for training and fishpond development contemplated in AID Guaymi Area Development Project, with DINAAC providing technology and technical assistance on demand. First thrust should be into eastern districts of Chiriqui which have highest indices of poverty and malnutrition in Panama.

° Next step would be Herrera, perhaps beginning with modest demonstration project. Los Santos would be left for last, depending on capacity.

- With regard to outstanding requests for ponds, these should be given priority; within that group, priority should be granted to projects which respond to the sequence outlined above.

Two concepts about outreach have been articulated by DINAAC direction and staff: 1) growth pole strategy, beginning with distant site and working back to center; 2) working incrementally out from center.

- Experience with distant sites suggests that growth pole strategy is high-investment, high-risk. An incremental strategy outward from the center appears more realistic and better suited to institutional capacity.

Criteria for site selection in general and for demonstration sites in particular.

- Should be developed as part of Project Paper.
- Suggested primary criteria:
  - Use communities which, as mentioned above, have displayed initiative and persistence,
  - Are strategically located geographically in relation to other communities and which may have already generated a multiplier effect,
  - And are reasonably accessible to that they will not suffer from problems of logistics.
- Decision as to basic strategy should be made centrally, not at the regional level.

Commitment of individual MIDA regional offices to the fishpond program and the quality of available personnel vary.

- Before directing its energies toward any given area, DINAAC should determine MIDA regional level of commitment and capacity, as well as openness to learning new technology and new dissemination techniques. Criterion becomes the same as for community selection -- spontaneous and shared expressed interest.

Continued limitations on numbers of qualified extensionists available to the program and continued problems of accessibility to distant sites.

- Train two levels of local-level personnel:
  - Volunteer leaders: enough technical training to permit intelligent promotion and basic maintenance.
  - Village paraprofessionals with additional training in horticulture, tilapia-sexing, and small animal production (e.g., disease surveillance and injections). Some salary plus a community extra benefit, e.g., hatchery capacity, would heal off problems of envy and conflict with onw-household economic demands.

Community participation is not a major issue in small pond projects. It becomes crucial as projects expand in size and complexity and does not respond to exhortation.

- DINAAC training of any extensionists should focus explicitly on the community development and participation needs and problems

entailed in the addition of each component on road to full integration. Such an approach suggests a modular, problem-oriented training style.

The limited amount of available land, the lack of faith in the quality of that land, limited success in growing vegetables in the past, indigenous concepts of what constitutes "real" food and what a vegetable is, imply the need for special help in this area, especially since a number of groups are now undertaking horticulture. Experience to date indicates that the best garden projects are highly managed by outsiders; the community contributes labor and does not seem to replicate its learning from that labor on its own land. More accessible projects depending on inputs and technical assistance from various institutions report mixed experiences and success.

- Vegetable projects should not be attempted unless 1) there is resident expertise available (in distant sites) or 2) there is easy and frequent access to technical assistance which is in turn dependable. An increase in number of vehicles and scheduling of their use should help. In the case of distant sites, community members working in garden projects should be taught as they labor so that they can ultimately manage the community plot with relative independence or, where feasible, start their own.

Extension

Logistical limitations, primarily vehicles, tractor.

- Project vehicle plan should be reviewed to respond to any revision in pace and scope of expansion and needs for flexibility of access. Decision on deployment should be made centrally.
- While private sector/community contribution aspect of current arrangements for tractor use in Veraguas has undeniable attractions, possibility of tractor purchase under project should at least be explored. It should be remembered that for most Veraguas families, ingenio work is the only source of cash, and any diminution of those earnings is important.
- Consider one small bus for transporting trainees, community members for training and visits to different demonstration sites.

Availability of extensionists, especially those with special training.

- Since first graduates of University intensive pisciculture training (carreras tecnicas agropecuarias) will not graduate until approximately August 1981, special training for MIDA extensionists in pisciculture and community development should be offered as soon as possible.
- Since the number of students now in the University course who will accrue to DINAAC is undefined, the project should contemplate use of some technical assistance money to provide salary supplements for the first graduate year, so that more students will be attracted to DINAAC rather than be so quickly lost to the private sector.

MIDA's concentration during the decade on asentamientos, with less impact than was hoped for, indicates flaws in extension techniques. This research suggests a major lack of training in field outreach techniques and self-management, made worse by work overloads and vehicle shortages. Skills in leadership selection, understanding of community dynamics, and cooperative formation appear weak to variable.

- If the limitations of MIDA extension services and training have not been examined to see where the training contemplated under the Project should focus, they should be. This study concludes that, in addition to training in the new technologies involved, extensionists should get training in group dynamics, leadership selection processes, credit and economic aspects of project components, cooperative formation, rural culture and economics, development of campesino promoters and paraprofessionals, together with field practicum sessions oriented toward real problem-solving, as well as techniques of elaborating work schedules.
- Curriculum for University pisciculture students should be modified so that "extension methods," now scheduled for the last semester (beginning May 1981), be taught in the 4th semester (beginning September 1980), so as to precede the 2-month supervised practicum. The last semester should include a follow-up, problem-oriented workshop in the last semester.
- Assignments of extensionists should permit at least a 2-week period before beginning program activity, with no other demands

than getting to know communities in his/her area, with another 2 week for possible census and needs and achievements assessment.

Accessibility and the best technological mix.

- The project should contemplate exploration of which technological mixes (levels of integration) correlate best with remote sites as opposed to sites of relatively easy access.

Relative lack of success in Guaymi area (as defined by lack of active community participation and management, and the impact of this on technology).

- Use of Guaymi Development Project promoters to determine community needs in the area and promote fishponds etc. as appropriate, with DINAAC acting only as technical facilitator.
- Seminars for all extensionists responsible for providing technical assistance in the Guaymi area, in the basic components of Guaymi culture, social organization, economic life, and special needs, given by anthropologists/sociologists, technicians who have worked successfully with the Guaymi, and by the Guaymi themselves.

Lack of audiovisual materials.

- Given that fishponds are their own best advertisement, consider videotape rather than film for educating extensionists and communities, promoting program.
- Simple forms for extensionists to use for prescribing feeding regimes, schedules for purchase and harvests, sexing, etc.

Community Development and Participation

Projects arising from spontaneous community desire for a pond and organization to construct one show highest continuation rates and fewest organizational and collaborative problems.

- DINAAC and MIDA should concentrate on spontaneous requests for ponds, beginning with requests now pending, particularly in the consolidation area and in any areas slated for expansion, e.g., Cocle. (See Expansion).

Demonstration and multiplier effects work if project not too big, elaborate, or obviously needing a lot of outside technical expertise and/or money to run.

- Keep scale of demonstration projects as small as technologically feasible.
- Build on existing community success in consolidation area.
- Involve community which is site sponsor in operation (not just manual labor) of project.

No single organizational type provides a better basis for fishpond projects than any other type, although having had some other community project experience with even modest success helps.

- DINAAC should give preference to communities with some history of joint action if they have spontaneously sought help with a pond. However, a group which has newly formed for such a purpose and is persistent in its intent should be not rejected, if the situation is such (e.g., fair accessibility) that support could be easily gotten.

Projects which were more or less "dropped" on communities via a paternalistic promotional style, especially in large, dispersed communities, may be more visually impressive and more productive (though not invariably), but they appear to be vulnerable to failure if technical support diminishes or changes, and more likely to evoke community strains. The food-for-labor model is not necessarily bad; it is just, in this case, insufficient.

- The high-technology, imposed, showpiece model should be set aside for now. DINAAC should experiment with incremental models which educate communities to processes and to their potential to handle them. Campesinos themselves recommend that they be taught the technology, through on-and off-site training. Food-for-labor does not have to be discarded.

Low knowledge levels vis-a-vis more complex components of integrated projects such as penned pig-raising and horticulture.

- Special training programs for community-selected campesinos in key aspects of these technologies.

Ignorance of economic implications (costs and benefits in cash and kind) of project involvement, and proper pricing of products.

- Inclusion of techniques for simple economic planning in extension training, for use with campesinos as a group, not just with leaders.

Lack of understanding of cooperative forms and meanings, especially at increased levels of project complexity.

- Gradual education to implications, meaning , and value of cooperative form from beginning of project, increasing in detail as projects gains complexity. Should include assistance with acquisition of pre-cooperative status and personeria juridica.
- Repeat pre-cooperative course for a limited number of other communities and informally evaluate comparative success against other projects started at same time to see if worthwhile. It may be that refresher training will be needed, particularly in area of economics.

Mixed success with leader slection, problems with paid local-level extensionist.

- DINAAC should establish criteria for leader selection, include training in processes of community selection of leaders, including possible use of secret balloting.
- Local-level promoters and paraprofessionals should be chosen in conjunction with the community and not simply appointed.

While there were no identified problems about getting and keeping land provided for community ponds, without some legalization problems could arise.

- DINAAC should adopt use of a simple transfer document similar to that used for AID SDA fishpond projects.
- In Guaymi areas, landholding and kinship patterns should inform structure of community participation. If land for pond is owned

(de jure or de facto) by kinship group, project participation may not extend beyond that; where land is communal and agreement is across kinship groups, a larger beneficiary grouping may be realized.

Conflict of project needs with peak agricultural demands on-and off-farm.

Rationalize schedule for heavist project-related workloads (draining, salvaging fertile silt, clearing gardens, building dams and pigpens) for slack agricultural periods. Women can handle everything else, and do.

- For this reason, program should encourage inclusion of at least one woman on project directivas.

Current radio approach works at community level.

- Program should be continued, perhaps expanding with some case studies and interviews which should be realistic as well as hortatory and laudatory; interviews with campesinos from communities which have had problems and solved them would be particularly persuasive.

Theft from ponds and gardens.

- While communities will have to be helped to evolve systems for dealing with this, siting of ponds close to residential nuclei should be adopted where feasible.
- Demonstration sites may have to include money for fencing.

Technology

Low yields, inadequate feeding, infrequent harvests, low consumption.

- Request special price for feed from producer, now selling to DINAAC at regular commercial price, request based on technical assistance provided to company by DINAAC in development of feed.
- Add pigs, chickens, ducks, grass as possible, recognizing dilemma of higher yields at higher cost from pellets.
- Experiment with different continuous harvest designs: large ponds with polyculture, male and female tilapia, double-pond systems, local breeding capacity, various levels of integration, and numerous smaller ponds in same area with rotating harvest pattern.
- Educate communities to importance of proper feeding and fishing techniques.

Evaluation

Lack of institutional knowledge of project history and effects.

- Systemalize DINAAC records on projects and include data on: number of households and individuals benefitted, origins of project (spontaneous/promoted), criteria for community selection, key contacts/leaders/potential trainees, economic data (costs, harvest sizes, consumption, sales, proportion of consumption to sales, inputs, net income). Suggest use of modified Subproject Submission format used in Guaymi Area Development Project Paper. Record-keeping should be standardized across regions.

Difficulty of measuring nutritional impact.

- Restrict nutritional study to less costly dimensions and to measurement of consumption only, or maintain at same budgetary level but include aspects of community participation, spread effect, and benefit incidence (spin-off projects, replication). Nutritional assessment should provide disaggregation by key age cohorts. Sample should include different project types and communities selected according to criteria of accessibility, ethnicity, and age and origin of project.

ANNEX X

# A METHODOLOGY FOR EVALUATING THE NUTRITIONAL IMPACT OF THE USAID PANAMA MANAGED FISHPOND PROJECT

A REPORT TO THE USDA NUTRITION ECONOMICS GROUP
UNDER CONTRACT NO. 53-319r-0-45

By: Judith McGuire
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Under RSSA 3-77 (Economic Analysis of Agricultural Policies) with the Office of Nutrition, Development Support Bureau, AID

21 December 1979

## Introduction

The contractor was requested to review the managed fishpond project of USAID and the National Directorate of Aquaculture (DINAAC) in Panama. In Panama, from 26 November 1979 to 15 Damcember 1979, she reviewed project documents and other relevant materials, met with representatives of pertinent organizations (Appendix IV), visited a number of fishpond projects in Veraguas Province (Appendix V) and interviewed participants and potential participants in community fishpond projects. The following report summarizes: (d) findings from interviews in the field and (b) options for evaluating the nutritional impact of the program-including a detailed scope of work for the evaluation.

The report indicates that:

(a) The managed fishpond program can have an impact on populations which are remote and subsist mostly on rice and tubers if and only if adequate amounts of fish are harvested weekly to be distributed to every family. The amount of fish depends on the targets set and the size of the pond depends on amounts of fish needed to be harvested weekly.

(b) The evaluation of the 30 demonstration ponds should be by interview carried out in all homes (15-30 families per community) which eliits information on consumption, expenses and income. Interviews will take place during the preharvest (June-August) and postharvest (January-March) periods both before and after the fishpond is functioning. Impact will be measured as a change in protein intake per consumption unit and income and expenditures per capita.

(1) In Option A, individual households are the focus of the evaluation. Each household's one-day consumption and expenditure will be obtained three times in each pre-and post-harvest season. Households will be used as their own controls and paired tests (2 way analysis of variance) will be used to test whether consumption changed.

(2) In Option B, communities are the focuse and each household need only be evaluated once. Group data, using communities as their own controls, will be used to test differences in consumption by season due to the fishpond.

(3) Option A is preferred because it overcomes the problems of large inter- and intra-household variations, it is a more powerful statistical tool, and it allows investigation of intervening variables.

(4) Regression analysis will be used in Option A to evaluate the realtionship between expenditures and consumption. In both options, regression analysis will be used to relate income expenditure and consumption across all villages using season and fishpond function as dummy variables.

(c) Target levels of change must be set based on baseline data and those levels in turn should determine size and harvesting of fishponds. They must take into account maximum frequency of fish eating desired.

(d) The non-nutritional impacts of the program may be just as important as the nutritional ones in improving the quality of life in the target communities.

DRAFT
J. McGuire
12/11/79

## Chapter 1. Reconnaissance

Between 5 and 7 December 1979, three communities in Veraguas were visited. In each place the investigator interviewed several villagers about family composition, morbidity, food habits, breast-feeding and weaning practices, agriculture, seasonal changes, income and expenditures and use of fish. The communities are described below. (Appendix I)

### I. Description of the Communities

#### A. Rincon de las Palmas -- 5 December

The village is located on a moderately good dirt road, about 20 minutes' driving time from the Pan American Highway; about 1 hour from Santiago, the provincial capital. In 1970 the population was 230 in 51 households, all Latinos. While several families live at a distance from the central compound, most reside close together along the dirt road. In spite of the fact that some government services have reached Rincon (primary school, potable water system), the residents are isolated from the health and market systems. The nearest health centers are about an hour away (one is reached on foot, and the other can be reached by local transport at a charge of $0.40). Except for semi-weekly sales of fish by outside entrepreneurs, there is no regular participation in the regional market system (centered in Santiago).

Houses are primarily of adobe brick walls with corrugated metal roofs but many people live in mud and wattle homes with thatched roofs. Most households have latrines.

While practically all residents engage in subsistence agriculture, they also earn an income from cutting sugar cane near Santiago during several months of the year. Other local employment in agriculture is also available intermittently.

Rincon is touted by the extension agent as one of the most well-organized communities in the fishpond project. Thirty-one people -- a little over one-third of the households -- are members of the fishpond cooperative. Their last harvest, in mid-October, yielded 530 pounds of fish, all of which was sold to pay for concentrated fish food. Members bought fish at $0.20/lb. and non-members at $0.40/lb.

B. Buenos Aires - 6 December

To reach Buenos Aires one must travel about 30 km. over a very poor dirt road that is often impassable in the rainy season. In a 4-wheel vehicle it took 2-1/2-3-1/2 hours to traverse the distance between the Pan American Highway and the village. On foot, it takes 6-8 hours. Commercial goods, fresh foods, and meat rarely reach the village from outside.

The community, composed of indigenous Guaymi people, has only recently been centralized. The overall population of Buenos Aires is 150 but the dispersed population of 20 surrounding communities, each with populations ranging from 60 to 100 people, are within the sphere of influence of the cacique (mayor) of Buenos Aires. Buenos Aires has benefited from several government programs, especially those focussed on the indigenous populations. A hand pump provides water for the population year-round and there

is a health post in the village intermittently served by practicantes (medical students). The major bottleneck in provision of health services seems to be lack of medicines, mostly due to the village's isolation. There are also two schools in the town - an elementary school and a ciclo basico.*

Housing is primarily of the mud and wattle variety but a few homes have metal roofs (the remainder being of straw). Many of the households have latrines.

As in other parts of Veraguas the soil is poor there and the residents complained of low productivity of the soil. The local crops are tubers, corn and rice. The cooperative owns 120 head of cattle of which some are sold three times a year.

During the sugar harvest men migrate to Santiago for 2-4 weeks at a time to cut cane. This provides the major influx of money to the village.

Buenos Aires is the showcase of the fish pond experiment. It has been visited by all the major Panamanian leaders and by U.S. Senator Long (the small local airfield has made such visits possible). All of the residents of Buenos Aires are members of the fish pond cooperative.

The 4 fish ponds are stocked with several varieties of fish and the offspring of the Tilapia are harvested weekly. Fecal matter from a pig raising project fertilizes the fish pond (no other fish food is added) and the costs of maintaining the pigs is covered by profits from selling them. The animals are marketed by the DINAAC personnel who also purchase

*This is an educational program for rural junior high school aged children which teaches them fundamentals of agriculture, mechanics, and household maintenance in addition to the basic educational curriculum. The school planned for this village has been built but the government has delayed putting the program into operation.

pig feed and carry it to the village.

Runoff from one of the ponds and the fertile bottom soil are added to the two gardens in which grows cabbage, beans, cucumbers, tomatoes, lettuce, spinach, green pepper, chives and eggplant.

The last harvest from the fish ponds had taken place 10 days before, at which time the pond was emptied in order to clean out the sediment which had built up. None of the other ponds was in weekly use at the time of the visit.

C. Peru -- 7 December

The town of Peru, located about 1 mile from the Pan American Highway, belongs to an asentimiento* which provides employment for many of the residents. The population -- 89 people in 17 households according to the 1970 census - lives in mud and wattle houses with metal or straw roofs. The government has provided the residents with a hand-pumped water system but the nearest school and health center are several miles away.

Due to their proximity to the Pan American Highway, the residents have access to commercial markets and transportation which enables the men to work in nearby towns of Divisa and Santiago. Little or none of the land is cultivated privately by Peruanos and the economy is nearly entirely a cash economy.

*A government project relocating rural farmers and utilizing them in higher technology, commercial agriculture. The men are paid daily wages but not usually given subsistence agricultural plots.

There is no fish pond in Peru but the people have organized a cooperative to request that technical assistance be given them to construct a pond.

The town of Peru was only briefly visited because most of the women had gone to the elementary schools a few miles distant to observe the Mother's Day presentations of their children. The women were interviewed at the school.

## II. Findings from Preliminary Reconnaisance of Food System

Not all questions in the format (Appendix I) were asked of every subject and frequently male and female heads of household were simultaneously interviewed. The "24-hour recall" was of total food consumption by the household. Questions were also asked about food given to preschool children, if present in the household.

Difficulty was encountered in obtaining accurate estimates of non-meal eating (numerous bananas and oranges were consumed and parents could not say how much fruit their children had eaten). As such, it is probable that energy but not protein was underestimated in this inquest.

While quantitative data will be presented, the reader must keep in mind that the measurements were not precise (no leftovers were available to be weighed) and estimates had to be made of weights of tubers used since the weighing scale was inadequate to weigh the 6-8 pound roots.

The sampling was not scientific either. The investigator requested of DINAAC that she be taken to one village that had recently harvested fish, to one that had a fish pond but had not recently harvested fish, and to one that had no fish pond. In each village, houses were chosen at random without any criteria for selection except that they were within

walking distance. The women from Peru, interviewed at the elementary school, were self-selected. In spite of these limitations the investigation provided good information about food patterns and about probable difficulties that will be encountered in future, more precise, investigations.

A. Demographics

Four women were interviewed in each village. Of the 12 women interviewed, 4 were in their 20's, 4 were in their 30's and 4 above 40 years old. All of them had children living at home, but only eight women had preschool children in the home (a total of 17 preschool children; some being grandchildren of the subjects). The 12 women had born 79 children, of whom 13 had died. Three women had had miscarrages.

All women were united or married, although the men with whom they lived intermittently migrated to work or study. None of the women worked for wages. All of the subjects interviewed had cedulas* for themselves and their children.

B. Food Consumption

The diet of the rural people is largely composed of rice, yuca** and name**, which are consumed daily by most people. These foods plus bananas provide the bulk of the energy intake but all are of low protein quality and quantity.

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* birth certification

**tuberous roots; name = Dioscorea otoe = taro root

High quality protein foods are consumed infrequently. The figures on meat consumption (beef, pork and chicken) were markedly higher in Peru, which has easy access to the marketing system, than in Rincon and Buenos Aires (10.5 days per month and 3.7 days per month, respectively). By the same token, fish consumption was much higher in Buenos Aires, which has weekly fish harvests, than it was in the other two villages (14 days per month and 6.2 days per month, respectively). The worst off community was Rincon which had neither regular meat supplies nor regular fish catches. It should be noted here that in Buenos Aires and Rincon fish and large shrimp (1/4 lb) were trapped in the rivers from time to time.

Analysis of the previous day's consumption indicated that energy and protein were lacking in the diets of these ($1334 \pm 445$ kcal and $43.6 \pm 18.7$ gm. protein per consumption unit or 67% and 73% of recommended values, respectively) people. It must be mentioned, however, that the quality of the protein is extremely low and that in two villages (Buenos Aires and Peru) the observed meat consumption was a typically high for their own stated frequencies of eating meat. For instance, the observed frequency of consuming beef would mean they ate meat 7.5 days per month but they estimated that they ate meat once a month. Only fish consumption of all the protein foods occurred less frequently in this investigation than would have been expected from their estimated frequency of eating it. The slaughter of cattle in Buenos Aires is infrequent so the arrival of the investigator the day after a cow had been slaughtered was an unfortunate piece of luck. For the aforementioned reasons, it is assumed that quality of the diets (in terms of high quality protein consumption) is even lower than that observed.

The protein density of the diets (gm. protein per 100 kcal.) was 2.5 overall which would be adequate for most age groups (requirements range from 2.0 - 3.3 gm. protein/100 kcal.) if the protein quality were high (which it is not). Taking the usual diets, however, (i.e. those without meat) the protein density is 2.1 gm/100 kcal (barely adequate) and the worst diets (those without meat, milk or beans) had a protein density of 1.6 gm/100 Kcal, both of which indicate insufficiency of protein, especially high quality protein.

If the nutrient density of the usual foods were examined (Table 1), it is clear that the rural population maximizes bulk and energy intake (given the predominance of rice and tubers) and minimizes cost. They also choose the protein sources of least density (either in terms of bulk or energy) because those foods are locally available. Where bulky high carbohydrate foods like these predominate in the diet, small children suffer nutritionally because their stomachs are too small to eat enough volume of food to achieve protein sufficiency. The protein density of fish makes it an excellent substitute for any component of the present diet (volume for volume or calorie for calorie).

Data on food expenditures and food consumption for the previous week were difficult to obtain. With probing such data might be obtainable but great interest was not shown in household accounting. This applies equally well to income estimates which were difficult to pin down even for limited time spans (e.g. how many weeks did the man work cutting cane in the last dry season).

The seasonality of food consumption was related to outside income and to agricultural seasons (Figure 1). The worst time of year is June-August, when neither income nor food are available, and abundance is during the harvest months (January-March) when men earn an outside income.

Other seasonal factors such as rain, the school year, and holidays were not mentioned as affecting either income or food availablility.

TABLE 1

Nutrient Density (From INCAP Food Component Tables)

(Assume all grains + beans cooked; 1 gm dry rice or corn = 2g. cooked; 1 g. dry bean = 3.6g. cooked)

| | gm protein/100 cal | gm protein/100 gm | Cal/100 gm | Price/lb. |
|---|---|---|---|---|
| Rice | 2.0 | 3.6 | 180 | $ .20 |
| Corn | 1.9 | 3.6 | 190 | $ .10 |
| Name | 1.9 | 1.9 | 100 | Subsistence |
| Yuca | 0.5 | 0.8 | 150 | Subsistence |
| Banana | 1.2 | 1.2 | 100 | Subsistence |
| Fish | 20.1 | 20.0 | 100 | $ .40 |
| Beef | 18.0 | 21.0 | 110 | $ .80 |
| Chicken | 10.6 | 18.0 | 170 | $ .80 |
| Beans | 6.6 | 7.8 | 180 | $.35 - .40 |
| Otoe | 1.2 | 1.5 | 130 | Subsistence |

FIG. 1 - SEASONAL FACTORS IN NUTRITION

| FIG. 1 | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rain * | | | | | | | | | | | | |
| Food Availability | ← Abundance → | | | | | ← Scarcity → | | | | ← Abundance → | | |
| Outside Work + | | | | | | | | | | | | |
| Illness | | | | | Diarrhea | | | | | | Grippe | |
| Maiz | Harvest | | | | Plant | | | | Plant Harvest | | | |
| Arroz | | | | Plant | | | | | Harvest | | | |
| Frijol Bejuco | Harvest | | | | | | | | | Plant | | |
| Poroto | Harvest | | | | | | | | | | Plant | |
| Guandú | Harvest | | | ← PLANT → | | | | | | | | |
| Otoe | Harvest | | | Plant | | | | | | | | |

* No Rain

Transition

Rain

\+ Work in Agriculture

Work in Cane Harvest

Intermittent Work in Ingenio

Otoe, yuca & ñame must be eaten within a couple of months of taking out of ground but can be harvested year round

Children are breastfed for 1-2 years and outside foods are given to them are early as 4 months. Apparently no special foods are either prescribed or proscribed for the nursing infant or weanling. Table foods are the most common first foods of babies. When subjects were asked if they gave fish to children, including nursing infants, the responses were positive in all cases and usually implied that of course fish was given to children.

Regarding distribution of food within the household, responses showed that children were allocated at least their share and in some cases given preference over the parents because an adult "knows how to withstand hunger" ("uno sabe aguantar hambre"). Since the littlest child often eats from its mother's plate it would be difficult to measure the child's consumption in order to prove or disprove this point.

C. Morbidity

The change of seasons (April-May; November-December) was cited by most people as a time of increased incidence of illness (diarrhea in the spring and colds in the fall) but the rainy season was thought to be a time of higher overall incidence of disease.

The morbidity of the week prior to this interview was moderate (15 out of 59 people became ill for 87 of 413 person days) and entirely comprised of upper respiratory infections (supporting their assessment of typology of seasonal illness). All in all the local people felt their children were not sick frequently but perceptions of illness (especially diarrhea) are relative to the "normal" level of illness. Several people did mention that the children suffered from parasites but this investigator noted few children with the "bloated belly" look which often accompanies serious parasitic infection.

D. Agriculture Production

Data on agricultural production were difficult to obtain because:

(a) people do not know the size of their plots (they measure in hectares).

(b) many people only casually measure their production, and

(c) the root crops are not harvested all at once but continuously. After the roots are removed from the ground, the proportions sold and kept for home use vary from month to month.

(d) agricultural plots are frequently shared with sons and brothers so it is difficult to gauge the food flows to each individual household that works the unit of land.

In general, rice, corn, tubers and beans are planted. Beans - guandu, poroto, and frijol de bejuco* - are minor crops of which the yield is usually consumed in the household and does not last for the year.

In Rincon the farmers said they were currently planting more corn than they had in the past because they could get a better price whereas formerly more rice was planted. Otherwise the subjects did not mention any changes in cropping patterns in recent years.

E. Income and Expenditures

As mentioned above, data on income and expenditures were difficult to obtain. Men cut cane and work in the sugar mill from January to March. They may also obtain employment in May and June after they have planted their crops but on the whole the work was intermittent and short term.

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*guandu = pigeon peas; poroto = kideny beans; frijol de bejuco? (small red bean)

Local cattle owners employ some men to fix fences but the extent of locally available work was not investigated. Several families also received regular income from older children who were working in the city.

Women and men engaged in small-scale crafts production (straw hats and woven bags) but larger scale entrepreneurial ventures were not encountered. None of the children or women were employed in the formal labor sector.

Expenditures were largely on food (ranging from 22-63% of the previous week's expenditures). Although food was scarcest in the preharvest season, people stated that they always ate the same types of food, although it had to be purchased during the worst months. When asked whether they ever owed money to the local stores, most people said they sometimes owed money but preferred to pay it off as fast as possible. Others said they would rather go hungry than owe money for food. This leads one to question how, given the indicated employment patterns, people pay for food in the preharvest period.

In all communities pumped water was available at central locations (although the water system in Rincon was in temporary disrepair) and latrines were found at most houses. The use of pumped water and latrines undoubtedly contributes to lower gastrointestinal morbidity.

F. Fish Ponds and Fish Utilization

The fish ponds were universally accepted as a source of food. Reasons for participation varied from food needs and curiosity to the perceived advantages of working cooperatively. Those who did not have a fish pond (Peru) looked forward to the communal effort as well as to the fish as food.

In Rincon most of the population is not associated with the fish pond project. When asked why, members claimed it was because the non-members did not have enough time, they were lazy, or they were not "joiners" ("no se meten en nada"). The non-members claimed they were not members because there nad been conflicts among members (some having withdrawn) and between members and teachers in the school. Others said they were not members because they had no time.

Without fail the women in each village were the initiators and active participants in the fish pond projects. They helped run the organizations and were outspoken participants at all levels. Not coincidentally, the fish pond projects (at least in the Latin areas) usually evolve from the Clubs de Amas de Casa (Housewives Clubs) and one of the strongest and most effective community organizers on the DINAAC staff is a woman.

Fish harvested from the ponds is handled in two ways in the home - it is used immediately (in soup, fried, or stewed) or it is salted and dried in the sun. The dried fish lasts about a week before becoming "putrid" or "rancid", according to the subjects. As a result, fish lasts no more than 10 days after it is harvested and most people used up their allotments in 2-4 days.

In Rincon, even the members of the fish pond cooperative must buy fish from the pond (albeit, at half-price, $0.20/lb.) but they are allowed to buy as much as they want. Selling the fish is necessary to pay for the fish food concentrate which is purchased and brought to Rincon by DINAAC extension agents. One man bought 17 lbs. for his family (he owns a refrigerator). The fish pond is completely harvested every 3-4 months and restocked. It is clear that non-members benefit from the increased

availability of fish (although at the same price as commercial fish) because it is readily available and very fresh.

In Buenos Aires, fish are allocated to members on the basis of work contributions. Most families received 8 pounds at the last harvest (which emptied the pond). Usual weekly catches averaged 50-70 pounds or about 1/3 lb. of fish per person per week. It was not clear whether fish was sold in the surrounding communities.

People of Buenos Aires are also given portions of the vegetable crop from the garden. While this may be an intermittent source of vitamins (which are probably lacking, at least seasonally, in the diet), the garden also serves to introduce people to vegetables which were previously uncommon, which may in turn encourage people to plant vegetables on their own.

As mentioned above, where there were rivers people were accustomed to catching and trapping fish and shrimp. While this is a source of high quality protein, the amounts are neither sufficiently large nor sufficiently frequent to cause major changes in nutritional status.

## III. Conclusions from Interviews

The reconnaisance trip in the field brought to light several points which are important to the evaluation of the nutritional impact of the fish pond project:

1) Energy as well as protein is limited in the diet of the rural population because of
   a) Inaccessibility
   b) Cropping patterns
   c) Low agricultural productivity

d) Low income

e) Low market access

2) Protein intake is low in quantity as well as quality because of

a) Predominance of tubers and bananas in diet

b) Low intake of beans, meat, fowl, pork, and fish

c) Low complementarity of proteins in diet

3) High quality protein foods are infrequently consumed because of

a) Low local production

b) Communities not reached by markets

c) Low income

4) Seasonal variations in food consumption are prominent, and are influenced by

a) Agricultural production cycles

b) Agricultural productivity

c) Seasonal income and employment patterns

5) Fish ponds can comprise a significant contribution toward improving the quality of protein in the diets if and only if fish can be consumed regularly and frequently by all members of the family.

## Chapter 2. Evaluating Impacts of the Managed Fishpond Project

### I. Measurement of Consumption, Expenses, and Income

#### A. Justification

The purpose of the managed fishpond project is to improve protein nutrition. While surveys have indicated that protein energy malnutrition is probably serious /e.g. 1/4 of preschool population has 2nd or 3rd degree malnutrition and there is a high infant mortality from nutrition-related diseases (1-3)/, the cause of the problem has not been clearly defined. Evidence from the preliminary reconnasisance described here indicates that the problems may be due in part to low availability of protein-rich foods. The fishpond program was designed to address the nutrition problem through increasing consumption of fish.

The project currently under consideration is the construction of 30 demonstration ponds in high risk villages* through introduction of pig raising to the fishpond scheme and use of fertile tilapia fish. Weekly harvests of fish will thus increase local protein consumption.

Each village will be composed of 15-30 households (according to Dr. Pretto) which makes it possible and desirable to study the effect of the fish ponds on all families in the village**. The villages have distinct matrices of environmental and socio-economic factors which impinge

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1. INCAP survey 1967
2. MOH survey 1975
3. Poynor report 1979

* See below for suggestions about criteria for selecting villages.

** See below for analytical methods

on human ecology (including nutrition) which make them individuals. Grouping disimilar communities together for the sake of analysis (i.e. grouping all data from pretest and posttest) is likely to conceal important differences rather than allow for more decisive conclusions in spite of the fact that the "n" will be quite large.

It is not likely that any effect will be seen in biochemical measures (such as blood albumen), in weight or height of the children relative to standards, or in morbidity. Blood albumen changes, for instance, are usually noted only in severe malnutrition. While growth rates may change, on the other hand, the small sample size within each village, the fact that the energy and vitamins are also insufficient, and that a myriad of other factors influence growth rates argue against anthropometry to evaluate this program. Furthermore, there is no evidence that improved protein quality or quantity, in and of itself, will improve growth performance relative to standards.

Morbidity is already low - as would be expected from areas that have potable water and latrines - although seasonal changes bring about short term increases in incidence of diarrhea and upper respiratory infections. Given relatively low incidence of disease, small sample size, and multiple etiologies of disease, it would be difficult to establish any causal relationship between an increase in high quality protein intakes and decreased morbidity.

Equally difficult to use would be infant mortality figures which are subject to large errors when calculated for small populations. The impact of nonnutritional factors on morbidity and mortality further limits the utility of these variables as monitoring or evaluation tools for this program.

Probably the best indicator of the nutritional effect of the fishpond project is consumption, particularly that of protein. Energy intake, food expenditures, and non-food expenditures may also be affected by the introduction of low-cost or free fish into the diet so those variables should be monitored as well. Since expenditures are related to income, it should also monitored.

While a cross-sectional survey of one day's intake provides sufficient information to estimate average intake of a population, it is not adequate to describe the usual individual intakes. To estimate usual individual* intakes, at least 3 days' intake are needed.

Option A will use the individual household as its own control and the impact of a fishpond will be tested using paired tests (see analysis). This option necessitates making several observations of one-day consumption and expenditure in each household within each round of interviews.

Option B uses community level data to compare average intake by season before and after intervention. Since population averages would be used, only one observation per household would be necessary each round.

The third Option (Appendix 3) considers the use of anthropometry to measure the impact of the fishponds on growth performance of preschool children.

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*The individual in this case is the consumption unit, be it a human being or a household

Seasonal factors are very important - food availability, household income, and food expenditures apparently exhibit marked seasonal fluctuations. The period of June to August, the preharvest period, is considered to be the time of low income, low food availability, and high food expenditures. The converse is true in the period from January to March. Therefore it is recommended that interviews be carried out in both of these 3-month periods in all villages. In that manner, consumption in each season will be compared before intervention and after intervention.

The effect of the fish pond on seasonal fluctuations should also be examined. Care must be taken to ensure that the fish ponds function normally during those seasons (It was found that some ponds are drained or lowered during the dry season, affecting harvesting schedules and yields).

B. Advance work required

Before the surveys take place, the communities should be censused and households enumerated. These data should be entered into a computer and household forms taken to the field and revised every time the survey crew carries out a round of interviews. It could take several days to census each community because dwellings are dispersed and heads of households may be difficult to locate. Each resident's name, sex, age, verification of birth date and location of residence should be requested. Identification of residence locations may require drafting a map of the area.

Prior to collection of data, the survey personnel will have to be trained by an experienced interviewer. It should require 3 days to train the teams in interviewing techniques, use of scales, familiarization with forms, and the scientific method. If possible, training should also

include practice sessions in the field.

C. Methods

In each household the following questions will be asked.

1. Who was present at each of the meals of the prior day (use census to prompt)

2. What was eaten the day before

   (a) Weigh as many items as possible.

   (b) "Recipes" used by the women (i.e. ask how each thing was made).

   (c) Prompt for easily forgotten items.

      (1) Bananas

      (2) Sugar, oil, sauces

      (3) Fruits, especially those in season which are eaten continually.

      (4) Common drinks and gruels (chicheme, chicha, "crema" (of corn), coffee).

   (d) What foods preschoolers were allowed to eat.

   (e) If rice, yuca* or name**did not appear in previous day's diet, ask about whether they were used.

3. What was purchased the day before

   (a) Food (including salt, sugar, coffee, spices, soda, snack foods).

   (b) Clothing

   (c) Medicine

   (d) Medical/dental care

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*Yuca = Manihot Spp. (cassava)
**Name = Dioscorea spp. (yam)

(e) Transportation

(f) Gifts or money transfers

(g) Rent

(h) Installment payments

(i) Fuel

(j) Soap

(k) Utilities

(l) Other

4. Were any gifts received the day before, including food?

5. Sources of income the week before

(a) Type of employment, total income

(b) Local casual labor

(c) Handicraft sales

(d) Sales of agricultural production

(e) Remittances from children or relatives

(f) Food for work (peones, juntas, etc.)

6. Local food prices of subsistence foods (ask of 1 of 5 families)

(a) Rice

(b) Corn

(c) Beans

(d) Eggs

(e) Chicken

(f) Yuca

(g) Name

(h) Sugar

The interviewers will be responsible for filling out the following forms:

Form 1: Household composition and attendance at meals of day before

Name Code Sex Age Breakfast Lunch Dinner

Form 2: Household food composition of day before (date)

| Food | Code | Amount(converted to std. unit) | Preschoolers given that food | | |
|---|---|---|---|---|---|
| | | | ID No. 1 | ID No. 2 | ID No. 3 |

Form 3: Household expenses of week before (from (date) to (date))

Type Code Amount

Form 4: Household income of week before (from /date/ to /date/)

| Type | Code | Amount |
|---|---|---|
| Formal sector | | |
| Local/casual day labor | | |
| Sales of agricultural production | | |
| Handicrafts | | |
| Remittances | | |
| Food/work exchanges | Value of goods at current prices | |

Form 5: Current prices (requested from 1 of every 5 families)

Rice price/lb. milled _____ manotada _____

Corn price/lb. on ear _____ dried & milled _____

Sugar price/lb.

Beans price/lb. green _____ dried _____

Eggs price/egg

Chicken price per lb. on the hoof _____

Only the dietary interviews (Q. 2, Form 2) and the previous day's expenses (Q. 3, Form 3) will be enquired 3 times during each round of interviews in each village under Option A. Only one interview will be

made under Option B.

The coders will be responsible for checking the veracity of the forms, calculating the total consumption units (see Annex II), encoding the forms, and rechecking the codes, sending the cards to be punched, and verifying punched data.

D. Targets

The targets of the project should be not only to effect a statistically significant change in protein consumption and to investigate interrelationships between income, expenditures, seasonal factors, and fishpond production, but also to bring about a predetermined change in protein intake.

Nutritional objectives can be set but people will only eat so much fish, regardless of how much they like it. Thus there is a upper limit on the effectiveness of fishponds in "curing" the malnutrition problem.

A modest expectation might be that total protein consumption will increase 10% over baseline values (yet to be determined). The protein intake observed here was approximately 43.6 g. per consumption unit. In a community of 25 households comprised of an average of 4 consumption units each, a 10% increase (4.4 gm/consumption unit/day) would mean production of 160,600 gms. of protein per year or 2,091 lbs. of fish (at 4.8 gm. protein per ounce whole fish (INCAP)) or 40 pounds of fish per week harvested from the fish pond. Since a Buenos Aires fishpond averaged 50-70 pounds/week, a 10% increase in protein may not be unreasonable. (Note also that the base figure used, 43.6 grm, includes two villages having ponds, so the actual base may be lower.) Calculations like these should be used to determine the size and stocking of the pond necessary to obtain the objectives. If the pond becomes impossibly large, target levels will have to be lowered appropriately.

An argument can also be made for establishing qualitative protein intake objectives. One could set the target of protein intake deriving from animal sources (meat, eggs, fish, and milk) at 20%. From the reconnaissance it was found that on meat eating days, 65% of the protein was contributed by animal proteins; on fish eating days, 14% of the protein was contributed by fish; and on the remainder of the days 7.3% of the protein was contributed by animal proteins (milk and eggs). If meat is eaten 5 days per month, fish 4 days, and no animal flesh the remaining 21 days per month, before intervention animal protein would contribute 18% of the protein. If the subjects ate fish 13 times a month after the pond was built (just over twice a week more than they presently consume fish), they could raise the value to 20% protein intake from animal sources.

One could also set targets of minimum consumption -- i.e. with the objective that at no point in the year should protein intake fall below 40 gm per consumption unit per day or, alternatively, at no point should the proportion of total protein intake contributed from animal sources fall below 10%.

Although these "targets" may allow the project manager to establish criteria for pond size, to keep track of progress toward goals, and to calculate costs per unit of nutritional improvement, the above targets have no functional meaning. It is not known if raising protein intake from 40 to 41 or 42 gms. has any physical significance. By the same token, no physical meaning can be attributed to raising the quality of protein in the diet from 15% to 20% animal sources. It is known that extremely low dietary protein quality and quantity have negative effects on populations but moderate deficiences have less measurable impact.

While it may be useful to set quantitative targets, these targets can only serve as milestones not as indicators of improved nutrition. There is no equivalent of litmus paper in evaluation of nutrition projects ... nothing that detects small functional effects of levels of moderate malnutrition.

E. Analysis

Consumption varies greatly not only among individuals but also from day to day for each individual. Thus, the standard deviation on a population is expected to be large - probably larger than the expected net increase in protein consumption resulting from the fishpond. Using the average intake (of 3 days, for instance) and pairing households before and after the intervention (in the appropriate season) enables the investigator to compensate for both inter- and intra-individual variations.

The paired comparison is also a more powerful test than a grouped comparison and using 3-day average individual data allows the investigator to compensate for non-nornal distributions of consumption within the population. Finally, the paired comparison yields data on absolute levels of change in each household and across populations which makes it easier to statistically test whether targets have been reached.

The disadvantage of the paired comparisons -- aside from requiring three times as many interviews -- is that households must be interviewed in all four phases to be included in the analysis. Migration, marriage, births and deaths all affect the number and composition of households. To overcome this latter problem it would be wise to identify households by one major established family member (probably the female head of household*) and compare consumption based on weighted nutritional needs,

*This makes sense for several reasons: (1) seasonal migration of men; (2) women's keeping custody of children if a marriage dissolves; (3) women are the household representative to be interviewed.

for instance expressing the results in terms of nutrients per consumption unit in the household.*

Two-way analysis of variance using 3-day average intake of the household before and after the fishpond within both seasons will test the following hypothesis (at a predetermined confidence level):

Hyp. 1 - Presence of a fish pond increases protein (or energy) consumption per consumption unit.

Hyp. 1.a. - in summer (June-August)

Hyp. 1.b. - in winter (January-March)

Hyp. 1.c. - overall (aggregating prepond and postpond)

If the paired control design is not used (Option B), then the group's average consumption per consumption unit will be used with one-way analysis of variance to test differences within season, prepond and postpond.

Because the project is to be implemented in three successive years in 10 villages per year, it will be possible to gauge qualitatively the impact of macroeconomic trends on the results. If during one period real income decreases in rural Panama, it should impact on all villages in that phase of the study. Trends can be taken into account in data analysis by factoring in the time period.

Analysis of expenditures (in terms of expenditure per capita) would also be calculated on an individual household basis under Option A and on a community basis under Option B and analyzed as food consumption was analyzed (supra). Under Option A the relationship between expenditures

*See Appendix II

and protein (or energy) intake could be tested by regression analysis, using season and fishpond function as dummy variables.

Income (per capita) and price data would have to be examined on a community basis regardless of the option chosen except in the unlikely case that it can be shown that income always lasts for one and only one week.

To tie all of the variables together, regression analysis should be done using protein (or energy) intake per consumption unit as the dependent variable and expenses (per cap), food prices (or some weighted function thereof), and income (per cap) as independent variables. Data on each community should be included as one data point for each combination of season and fishpond function. The investigators will then be able to determine how the relationship between income, expenses, and protein (or energy) intake is differentially affected by season and fishpond function.

There are other quite interesting statistical manipulations that could be done (for instance investigating the relationship between food consumption and medical expenses and among different expenses of the household). However these questions are peripheral to the evaluation of the nutritional impact of the fishpond and are only mentioned here to indicate the utility of the kinds of data to be gathered.

F. Criteria for a "complete" intervention

It is not enough to assume that the mere existence of a fish pond in a village is sufficient to cause a change in consumption. The intervention will be assumed to be "complete" (functioning at capacity) when weekly fish catches are possible. The postpond interview must be made when the pond is being harvested at least that frequently.

Many fish ponds currently in use are harvested only once every 3-4 months and fish consumption under those conditions is unlikely to have any impact on nutritional status of the community since consumption patterns are affected for only a short period after each harvest (within 10 days all fresh or dried and salted fish is consumed).

The project team may also wish to consider that the fishpond is not completely functioning unless or until all fish do not have to be sold to cover the costs of the pig-fish-garden scheme. The objectives of the fish pond project have not been clearly stated in this regard. If fish ponds are intended to provide an abundant source of fish at very low expense to the village, then one criterion of completion would be that most of the fish is not sold. It is possible that some small proportion must be sold to cover costs of restocking, just as vegetables may be sold to cover the costs of seeds. However, if the community must buy the fish, then the project may not reach the target population (i.e. the poorest groups in the villages) or it may have the least impact when nutritional need is greatest (i.e. when income and food stocks are lowest). Many ponds currently operating must sell all of the harvest to cover costs of feeding the fish. In the present project, the pig scheme was designed to obviate the feeding of the fish but it creates the problem of feeding the pigs. DINAAC and AID should finance or underwrite feeding the pigs until sales of pigs are sufficient to cover the costs of raising them.

In summary, the completion of the intervention - that time after which the effects of the project on consumption can be measured - will be achieved when

1) Weekly fish catches are possible
2) Most of the fish can be distributed free of charge to members of the cooperative.

G. Budget (See Table 2)

It was assumed that each interviewer could make 6 interviews per day - allowing for time necessary to reach a dispersed population - and it was assumed that about 1/2 day would be required to reach the community (or return therefrom).

Time for coding was calculated based on the belief that coding should be done very soon after interviews (assuming it is not advisable to wait until the interviewers are free to employ them in coding, even if the skills were present) and under the assumption that one person can correct, code, recheck, and verify 10 interviews per day. It is hoped that the cost of the data analyst and project director can be partially written off on other projects.

Option A calls for 3 interviews per household per season. Option B requires only one interview per household per season. If Option A is too expensive, it would probably be better if followed at random or stratified sample of households within a village or to evaluate fewer communities. Option A is more capable of detecting small changes at the household level and therefore is preferable.

## TABLE 2: BUDGET

| | | OPTION "A" | OPTION "B" |
|---|---|---|---|
| | Censuses+ | 90 person days (1 person) | 90 person days (1 person) |
| 1980 | Interviewers | 150 person days (3 people) | 50 person days (1 person) |
| | Drivers | 50 person days (1 person) | 50 person days (1 person) |
| | Cars* | 50 car days (1 car) | 50 car - days (1 car) |
| | Per Diem | 200 days | 100 days |
| | Equipment** | 3 sets | 1 set |
| | Coding, etc.*** | 80 person days (1 person) | 30 person days (1 person) |
| 1981 | Interviewers | 300 person days (3 people) | 100 person days (1 person) |
| | Drivers | 100 person days (1 person) | 100 person days (1 person) |
| | Cars | 100 car days (1 car) | 100 car days (1 car) |
| | Per Diem | 400 days | 200 days |
| | Equipment | 3 sets | 1 set |
| | Coding, etc. | 160 person days (1 person) | 60 person days (1 person) |
| 1982 | Interviewers | 600 person days (6 people) | 200 person days (2 people) |
| | Drivers | 200 person days (2 people) | 200 person days (2 people) |
| | Cars | 200 car days (2 cars) | 200 car days (2 cars) |
| | Per Diem | 800 days | 400 days |
| | Equipment | 6 sets | 2 sets |
| | Coding, etc. | 320 person days (2 people) | 120 person days (1 person) |
| 1983 | Interviewers | 450 person days (Max. 6 people) | 150 person days (Max. 2 people) |
| | Drivers | 150 person days (Max. 2 people) | 150 person days (Max. 2 people) |
| | Cars | 150 car days (Max. 2 cars) | 150 car days (Max. 2 cars) |
| | Per diem | 600 days | 300 days |
| | Equipment | 6 sets | 2 sets |
| | Coding, etc. | 240 person days (Max. 2 people) | 90 person days (4 persons) |
| 1984 | Interviewers | 300 person days (3 people) | 100 person days (1 person) |
| | Drivers | 100 person days (1 person) | 100 person days (1 person) |
| | Cars | 100 car days (1 car) | 100 car days (1 car) |
| | Per Diem | 400 days | 200 days |
| | Equipment | 3 sets | 1 set |
| | Coding, etc. | 160 person days (1 person) | 60 person days (1 person) |

+ Assumes 3 days enumerating per community.

* Does not include the probable need for horses which will have to be rented on site.

** Interview forms, scales, stationery & supplies.

*** Assumes coders can review, code, punch and verify 10 interviews per day.

Total

| | | |
|---|---|---|
| Interviewers | 1,800 person days (Max. 6 people) | 600 person days (Max. 2 people) |
| Drivers | 600 person days (Max. 2 people) | 600 person days (Max. 2 people) |
| Cars | 600 car-days (Max. 2 cars) | 600 car-days (Max. 2 cars) |
| Per Diem | 2,400 days | 1,200 days |
| Equipment | Max. 6 sets | Max. 2 sets |
| Coders, etc. | 960 person days (Max. 2 people) | 360 person days (1 person) |

Fixed Costs (Regardless of Option)

Trainer for Interviewers: (Lcda. Viodeldia Gomez? $20/day plus per diem)

1 week per team; 2 teams (1980, 1981) = 2 weeks.

Computer Time — INCAP food analysis tables program; Calculation of diets & consumption units; Analysis — rough guess $5 K

Data Analyst - 1/2 time for 4 years.

Project Director - Full time for 4 years.

Preparation of Report: two weeks writing
one week full time, typing

Photocopying: copies of report to responsible agencies

Travel costs: biweekly travel during 90 weeks of data collection Panama/Santiago (or whereever the field work is being done)

Lcda. Viodeldia Gomez (Regional Nutritionist, Veraguas; Complementary Food Program, Ministry of Health; Santiago) not only knows how to run field teams of dietary interviewers but also trains them. She says current salaries of her village health workers is $165/month and when they do interviews they pay an extra $5-10 per diem. Using these figures, the following costs for interviews were calculated (excluding costs of cars and gasoline):

Option A: $43,500
Option B: $20,800

These costs do not include any of the "Fixed Costs" mentioned above.

H. Timetable (Figure 2)

Regardless of the Option selected, the diagrammed interview schedule (Figure 2) is valid.

A timetable of interviews has been drawn up on the assumption that the project is approved and ready to begin by spring 1980. That is to say, money has been allocated, communities have been selected and organized, earthmovers have been obtained and field teams chosen and trained. A census of the target villages (supra) should be completed at least one month before the first interview, or by May, 1980. As mentioned in the research protocol each community will be examined once during January-March and once during June-August, both before and after fishpond function is complete.

If funding is delayed, evaluations will have to be adjusted accordingly. If necessary, the winter interview round can take place in October to December. The summer interviews must be during the period of June-August.

Since it requires at least 3-4 months for the fishponds to "mature" (reach the point at which weekly fish catches are possible), it was assumed that the first post-pond interviews could not take place until the year after the fishpond is constructed. It is possible that a fishpond constructed in January could reach maturity in May, but unless all of the ponds are able to do so, the interviews will be out of phase and the project may be faced with the necessity of a third team.

It has also been assumed (on the basis of discussions with extension agents) that fishponds can only be constructed during the dry period (January to March). If ponds can be constructed at other times of the year, it would be to the advantage of the evaluation because:

a) it would allow greater flexibility in the timetable

b) it would obviate the problem caused by the impact of pond construction on local labor supply, migration, employment, and (therefore) income in January-March.

If the ponds are constructed on the January to March period, the interviews will take place when none of the community has worked on the fishpond in the previous week.

The reader should note that the evaluation will begin 9 months before the first ponds are built and will continue at least 18 months after the last ponds are built.

| | 1980 | | | | | | | | 1981 | | | | | | | | | | | | 1982 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D |
| POND SERIES I | Census | Summer Pre Test Survey I | | | | | | | Install 10 Fish Ponds<br>Winter Pre Test Survey I | | | Establish target levels of protein consumption. | | | | | | | | | Winter Post Test Survey I | | | | | Summer Post Test Survey I | | | | | |
| POND SERIES II | | | | | | | | | | | | | Census | Summer Pre Test Survey II | | | | | | | Install 10 Ponds<br>Winter Pre Test Survey II | | | | | | | | | | | |
| POND SERIES III | | | | | | | | | | | | | | | | | | | | Census | | | | | | Summer Pre Test Survey III | | | | | | |

Assumes prior census in each villagd with enumeration (1980) or concurrent census & enumeration with first pre-test survey in
Assumes Fish ponds can be dug only in January-March.
Assumes 10 fish ponds will be built each year for 3 years starting January 1981.
Assumes Fish ponds require 3-4 months to reach capacity production (minimum requirement for post-test is weekly fish harvests)

| 1983 | | | | | | | | | | | | 1984 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D |
| | | | | | | | | | | | | | | | | | | | | Preparation of Final Report | | | |
| Winter Post-Test Survey II | | | | | Summer Post-Test Survey II | | | | | | | | | | | | | | | | | | |
| Install 10 Ponds<br>Winter Pre-Test Survey III | | | | | | | | | | | | Winter Post Test Survey III | | | | | Summer Post Test Survey III | | | | | | |

each village.

I. Logistical Problems

Undoubtedly difficulties will be encountered by the interviewers in:

a) obtaining lodging and meals*

b) locating and reaching all the community members within one week

c) getting to the villages during the rainy season (June-August).

It may be necessary to carry all the necessities with the team (food and shelter) although living in that manner for 10 weeks requires strength of character. It may also be necessary to equip the teams with rain gear, horses, and packs to enable them to carry out their duties. The problems of reaching the villages in the summer cannot be underestimated - the dirt roads are very poor and rainfall is heavy. The equipment needs will have to be reassessed once the demonstration sites have been chosen.

It is probable that the fish pond construction and stocking will fall behind schedule. Not only are there too few extension agents to cover this project in addition to the rest of the DINAAC ponds, but also community organizing can be a slow process, earthmoving machines are scarce and in high demand, weather can interrupt or delay implementation, and numerous social, political and economic factors can alter the planned timetable. Regardless of delays, baseline data and post-intervention data can still be fruitfully compared to indicate the impact of fish ponds on protein nutrition if several years do not pass between pre- and post-test interviews.

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* It is assumed they will stay in or near the villages where they are interviewing because of the excessive time lost and gasoline used in carrying teams to and from rural settlements.

The more serious logistical problem will be locating adequate field personnel. They will be employed only 20 weeks per year, they will have to be trained in interviewing techniques and dietary consumption recall, they will have to be highly motivated and capable of working under adverse conditions with the rural poor, and they will probably have to be women (to talk with the female head-of-household). It is assumed they will be Panamanian. While educational qualifications are probably not difficult to fulfill, the personal motivation, particularly among women, may be the most limiting factor.

The intermittent short term use of 4-wheel drive vehicles and their drivers may also be a limiting factor. Those vehicles to be given to DINAAC by the grant cannot be counted on for the exclusive use of interviewers 20 weeks per year. While it is possible that cars and drivers could take the interviewers out on Monday morning and return for them Friday afternoon, in remote places with dispersed settlements, the cars may be required to carry out interviews and to enable the interviewers to return to their lodgings in the evening. The need for cars will have to be re-evaluated once the fish pond sites have been selected.

Project management may be difficult to carry out from Panama City so ample time should be allocated for frequent trips to the field to oversee progress of the ponds, to maintain quality of the nutrition evaluation work, and communicate with and encourage the field team. If the Project Manager has excessive demands on his/her time, inadequate oversight may jeopardize the outcome of the project and the evaluation.

J. Factors Influencing Selection of Communities for Demonstration Projects.

From my reading and from my short visits to several fish ponds and to other communities in rural Veraguas (including conducting interviews about the food systems in three communities), I have concluded that the following factors significantly contribute to the nutritional problem:

1) Cropping patterns - predominance of tubers
2) Low agricultural productivity
3) Inadequate market system
4) Insufficient communications system (particularly roads)
5) Seasonal factors (environmental, agricultural, economic)
6) Low availability of paid employment

These negative factors are somewhat offset by the following positive conditions:

a) Widely available potable water
b) Frequent presence of latrines
c) High literacy of the population
d) Extended breastfeeding of infants

These factors should be taken into account when selecting the demonstration communities. To maximize nutritional impact the fish ponds should be located in areas where,

a) Fresh produce (especially beef) is not usually available.
b) Local agriculture is primarily of the subsistence type - probably tubers, rice and corn.
c) Local employment opportunities are scarce.

Criteria (a) and (c) relate in large part to the community's distance from good roads. I would suggest that villages be selected that are more than commuting distance from the Pan American Highway (e.g. 5-10 miles). The further one gets from the main road, of course, the more logistical problems are encountered in fishpond construction and maintenance and in interviewing.

During the selection process, several households in each candidate community could be interviewed about cropping patterns, frequency of eating high quality protein foods, and employment of family members. This should be useful in ranking potential locations for fish ponds.

As demonstrated in the Poynor Report[1]; there are a plethora of nutrition-related programs in rural Panama, especially Veraguas. While it would be difficult to control for the type or presence of other nutrition interventions in the demonstration villages (especially given the complete lack of coordination among the responsible agencies, voluntary organizations, institutes, ministries and sub-ministries), care should be taken to avoid multiple-intervention villages.

It would be unwise to compare villages having potable water with those that do not have it because intestinal parasites are very important factors in nutritional status. Since potable water is likely to enhance the impact of the fish pond projects, I would suggest that all demonstration villages have safe water sources. Since the Government is committed to bringing potable water to the population, this is the more relevant situation to study.

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[1]Poynor International, Inc. A Multi-sectorial analysis of the nutrition problem in Panama. June 22, 1979.

## II. Comments on the DINAAC Managed Fish Pond Project

The fishpond project is focused on increasing fish intake by rural Panamanians. DINAAC is also involved in the fish hatchery (including several research activities relative to crossbreeding and upproduction of food fish), commercial fish production, and dissemination of the technical findings emanating from the fish hatchery, but I do not know the relative budgetary weights of these programs within DINAAC. The community fishpond project is "limping along" at best. Their effectiveness is sub-optional due to lack of equipment (they need 4-wheel drive vehicles and a landmover) and due to some uninspired field workers who hold back their colleagues. Their modus operandi is to send 2-person teams out to work in the communities - one is the technical advisor, one is the community organizer. Since the technical aspects are not difficult to learn, it is possible that the community organizer could handle both aspects. There is a real shortage of staff who know how to handle the organizational aspects which comprise the more difficult problem. One staff person (the Sra. de Santa Coloma) is not only very capable in the communities but also has a radio program (temporarily taken off the air due to lack of money) devoted entirely to fishponds, which educates and motivates the listeners and passes on information from one community to the other. She interviews people participating in fish projects and has them explain how their projects are going, how they have solved problems, and how they use the fish. Few in DINAAC, except for Dr. Pretto, match her enthusiasm.

Although the project has an obvious nutritional focus, Dr. Pretto does not believe any nutritional impact will be noted and furthermore he

sees the current grant as institution building not as a nutrition intervention. This latter point is apparent from the allocations of funds in the PID (25% to pond construction, vehicles and nutrition studies; 75% to hatchery ponds, technical assistance, hatchery equipment and laboratory, fellowships for study in the US and educational materials).

I would argue that the Community Fishpond project is more a rural development effort than a nutrition intervention. Most importantly, it involves organization of communities to work cooperatively in improving their well-being. It also exposes the residents to new ideas, it may provide employment and increased exposure to the market system, and it enables people to take an active role in development.

It is clear to me that the fishpond project also addresses the protein availability problem. Its impact on nutrition could be further enhanced by use of the radio to teach fish preservation techniques and to encourage parents to give fish to their youngest children*.

I would like to comment on one area of the fishpond project that disturbs me - the dependence of the villagers on the extension agents. I have seen approximately thirteen fishponds communitées in all. They are all dependent on DINAAC to:

a) bring them processed fish food (for which the community must pay) or,

b) buy and sell the hogs and buy the pigfeed (using DINAAC as the lending agent).

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*Sra. de Santa Coloma is most eager to do this and asked to interview me for her radio program - the interview never came to be due to logistical problems, however I have passed on to her the information I thought necessary to convey the nutritional message.

Not only are the extension agents burdened down by these marketing functions but also the financial responsibilities are high. For the project to succeed, they must be good bookkeepers and completely honest. Needless to say, if the program were expanded greatly on a regional or national scale, the potential would be high for inadequate service to the communities, overworking of agents, abuse of power, and mismanagement of funds. Small scale fish ponds do not provide enough production to affect long-term nutritional status yet only the smaller ponds, in the present scheme, are manageable on a local scale.

I would like to see if smaller animals (chickens or ducks) could be used to fertilize the ponds or if local resources could be channelled to feeding pigs (e.g. feeding them fish, grains, vegetation and tubers) or fish. The zealous fervor which has been focussed on fish should perhaps be accompanied by equally serious consideration of the rest of the fauna involved in these ponds. This applies equally well to veterinary problems which extension agents are insufficiently trained to diagnose. The expansion of the pig production side of the Community Fishpond project will not - as far as I can tell - be matched by increasing veterinary skills of the agents. Since pig raising is not widely practiced in this area, there is probably little common sense knowledge about pigs presently available in the communities.

I question the need to send 6 students to the United States to receive Masters Degrees in aquaculture. While I am sure they will enhance the staff at the hatchery, I do not see any benefit in terms of improving the outreach to communites. The technology exists for making fishponds; it is qualified field staff who have the ability and enthusiasm to organize and guide groups which are lacking.

DINAAC can not move fast without an earthmoving machine either. I would like to see one earthmover substituted for the 6 fellowships. The earthmover could serve double duty - creating fishponds and improving the roads into the fishponds, which in turn would improve community access to the marketing system (although it would also confound the evaluation design). DINAAC also lacks nets to harvest fish (they have only one at present).

The proposal mentioned that 17 new extension agents will be added to the staff but these people can do nothing without cars. The fish tank trucks may serve double duty as extension vehicles, but I sense that they will reside at the fish hatchery in Divisa which is at some distance from the DINAAC offices in Santiago. The numbers are inadequate for 17 agents anyway.

The addition of 17 new extension agents calls to mind the management problems again. At present there is very little surveillance of the work of the agents - that and political pull have allowed the ineffective agents to remain at DINAAC. To ensure that new employees are qualified to carry out the extension activities, careful selection criteria must be used and their work must be closely supervised in the field. Dr. Pretto is over-extended at present and cannot assume such a task so a supervisor (or several) should be appointed. The supervisor must be familiar with the communities and have had long experience working with community groups. It is necessary to build up supervisory capacity before new extension agents are employed. This function will not be served by the people receiving Masters Degrees in the US (if in fact this was intended to be their function). Students, who have paper credentials and no experience working in the communities, may well frustrate the older more experienced extension workers.

The best way to improve the community fishpond program, in my mind, would be to obtain the equipment they need (4-wheel drive vehicles, earth-movers, and hatchery equipment) and to increase their field staff. A commitment to community development rather than the present objectives of institution building (Dr. Pretto) and nutrition (AID) would go a long way to making an impact on the rural environment.

One must also question what other mechanisms might be used to address the protein problem. Increased planting of legumes would go far to improve protein quantity and quality in the diet since bean and rice proteins are complementary. Other agricultural interventions - introduction of fertilizer and irrigation, for instance - coupled with an improved marketing system might also alleviate the nutritional problem.

One can also make a good argument that the provision of good year-round roads would be sufficient to increase consumption both by improving employment prospects and by facilitating marketing of food.

It is when considering alternatives to the fishpond project that one can appreciate the non-nutritional impacts of the program.

## APPENDIX I

FORMAT FOR FIELD INQUESTS -- 5/12 to 7/12

J. McGuire

1. Name of community _____

2. Name of woman interviewed _____ Nature of marital rel'n_____
   Age (cedula?)
   Time lived in town
   Reproductive history (live births; abortos; preschool children dead and of what causes)

3. Family data
   Members, ages (cedulas?), relationship to her
   Morbidity during last two weeks

4. Dietary/Consumption data

   A. 24 hour recall

      1) receipes

   B. Weekly food pattern -- last week
   C. Weekly food purchases

      1) last week amounts
      2) where purchased

   D. Food frequencies -- protein foods

      res puerco pollo/gallina frijol queso/ leche pescado huevos.

   E. Seasonality

      1) Best season: months, diet
      2) Worst season: months, diet
      3) Children's morbidity seasonality: what diseases in what months

   F. BF and weaning practices

      1) First non-maternal-milk food/drink
      2) When introduced
      3) Age of weaning
      4) Weaning foods

| Name | Sugar |
|---|---|
| Otoe | oil |
| Chicheme | spices |
| Masamorra | fruits |
| salsas | drinks |
| | spreads |

5. Household income/expenditures

A. Agricultural production

1) Crop -- acreage -- yield -- sold -- consumed
2) Land tenancy
3) Trends over time -- planting and yields

B. Outside income

1) Him -- type of work, months, weekly income
2) Her -- type of work, months, weekly income
3) Kids
4) Best and worst months for income?

C. Food budget

1) Best season (months)
2) Worst season (months)

D. Expenses -- per week (last week)

1) Food
2) Medicine and medical care
3) School and education
4) Transportation
5) Clothing
6) Services
7) Personal hygiene
8) Installments

E. Socioeconomic data

1) Subjective description of household
2) Literacy him _____ her _____
3) Pumped water (potable) _____

a) distance to nearest water source
b) seasonality of water
c) type of water source

4) Letrina? Servicio

other type of sanitary waste disposal _____

6. Participation in fish pond

IF SOCIOS

A. Why members?

B. Why others aren't members?

C. How often fish harvested.

D. How much did they get at last harvest? (when)

1) How much free? How much bought?
2) How did they use fish?
3) How did they prepare it?
4) How did they store it?
5) How long did it last?
6) Who ate it? How much? Prepared how?

E. How much work on fishpond by (kinds, days)

1) Him?
2) Her?
3) Kids?

F. How does coop decide how much to sell and how much to keep?

G. Who decides on stocking.

H. Did they earn any income from fishpond? How much?

IF NOT SOCIOS

A. Why not?

B. What are costs of belonging? Benefits? Benefits of not belonging?

C. Did they buy fish at last harvest?

1) How much? At What price?
2) How was fish prepared? Stored?
3) How long did it last?
4) Who ate it? How much? Prepared how?
5) Did they give fish to criaturas?

IF FISH POND NOT AVAILABLE

A. Would they like fish pond?

1) Advantages?
2) Disadvantages?

B. Do they eat fish now?

1) How many times a year? When?
2) Where do they get it?
3) When and where did they last purchase fish?
4) At what price? How much?
5) How did they prepare it?
6) How long did it last?
7) Did they give it to the criaturas?

COMMUNITY DATA NEEDED ____ FIELD INQUESTS 5/12 - 7/12

1. Community data

   A. Distance to nearest paved road?
   B. Distance to nearest health center?
   C. Total population

      1) Population in fish cooperative

   D. Population of nearby towns (sphere of influence)
   E. Nearest market -- distance/time
   F. Community organizations
   G. Prices in local stores of basic commodities

2. Fishpond data

   A. Size ($m^2$)
   B. Age
   C. Stocking pattern
   D. Auxiliary production (pigs? garden?) Yields, income, expenditures.
   E. Harvests of fish, dates, sizes, income and expenditures

      1) Percent sold to socios -- at what price? Percent given to socios?
      2) Percent sold to non-socios

         a) How sold? Who sold?

      3) Uses of income

         a) Expenditures for fishpond? pigs? garden?
         b) Amount returned to socios?

## APPENDIX II - CONSUMPTION UNITS FOR ENERGY AND PROTEIN*

| | ENERGY<br>1 unit = 2,000 kcal | PROTEIN<br>1 unit = 60 gm protein |
|---|---|---|
| | Consumption Units | Consumption Units |
| 7-12 mo.** | 0.5** | 0.4** |
| 1-3 yr.** | 0.6** | 0.4** |
| 4-6 yrs. | 0.8 | 0.5 |
| 7-9 yrs. | 1.0 | 0.7 |
| 10-12 yr. | 1.2 | 0.8 |
| 13-15 yr. | 1.5 | 1.2 |
| 16-19 yr. | 1.6 | 1.3 |
| 10-12 yr. | 1.1 | 0.8 |
| 13-15 yr. | 1.2 | 1.2 |
| 16-19 yr. | 1.0 | 1.2 |
| Man | 1.4 | 1.1 |
| Woman | 1 | 1 |
| Preg. Trim. 2-3 | 1.1 | 1.2 |
| Lactating | 1.4 | 1.4 |

n.b. Each meal missed should reduce the person's consumption unit 33% of original value

* From INCAP/ICNND. National Evaluation of the Population of Central America and Panama. 1965 - 1967. Regional Summary. DHEW Publication No. 72-8120, Washington, DC: GPO 1972.

** Some adjustment will have to be made for nursing infants - i.e. 1/2 consumption units allocated.

# APPENDIX III

## Option C - Anthropometry

In Option C all preschool children in each community are weighed and measured in summer and winter, both before and after fishpond construction. The number of children falling above and below 75% standard weight for age (INCAP growth charts) would be compared by Chi-squared analysis.

The people will have to be notified ahead of time in a general assembly of the community or through house-to-house contact (which would entail at least a day of field work). Due to self-selection bias (probably excluding the most malnourished children), it might be necessary to carry the scales to the homes of people who do not voluntarily bring in their children to be weighed. This search-and-weigh procedure could take several days.

While weights have a more tangible nutritional meaning to policy makers, this option is not likely to find significant results because

a) Growth performance is influenced by many factors other than protein quality and quantity (e.g. energy in-sufficiency, parasitic load, overall morbidity, activity levels, vitamin deficiencies and physiological status (viz rapid growth phase).

b) The probability of finding second and third degree malnourished children (i.e. under 75% weight for age) is only 1:4. If all preschoolers are weighed then the numbers should be adequately large for statistical tests. If, on the other hand, only children from 6-36 months are measured (since these are the ages when growth is most rapid and weight is a good indicator of growth velocity), then the expected numbers of malnourished children is less with lower probability of finding a difference in prevalence large enough to be significant in a chi squared test.

c) In serious malnutrition, the weight response to refeeding (i.e. catch-up-growth) is marked only in the first few months after refeeding. This poses a problem for scheduling and is superimposed upon expected seasonal fluctuations.

Height (length) determinations could also be made and might in the long run be a more sensitive indicator of growth performance than weight in and of itself. Height measures have the advantage that most malnourished children fall in low percentiles of healthy children. Frequency of children below selected percentiles (e.g. 90th and 80th percentiles) could be used to test the hypothesis about the effect of the fishpond program on growth. Since height gain is fairly slow, seasonal effects would probably not be detectable in short term height gain. Thus frequency of low height measures can be compared before and after introduction of the fishpond (measures being taken during the same season of the year).

Weight-for-height (comparison of observed weight with recommended weight for the child's height) combined with height percentiles can also give a good estimate of current nutritional status. The "Waterlow table" - numbers of children deemed normal, stunted, wasted, or stunted and wasted - can be compared by Chi-squared analysis before and after interventions by season to monitor changes in the nutritional well-being of the children.

As stated above, growth performance is influenced by multiple factors and an increase in protein quality and quantity is probably not adequate to effect a change in the growth parameters if all other factors remain unchanged.

Trip report of Judity McGuire
26 November, 1979 to 14 December, 1979
Panama

Meetings with People

| | |
|---|---|
| 26 November | Dwight Walker, AID/ARD |
| 27 November | Bob Jordan, AID/ARD<br>Anthony Cauterucci, AID/HRD<br>Herb Caudill, AID/HRD<br>Elias Padilla, AID/ARD |
| 28 November | Dr. Richard Pretto, DINAAC, Santiago, Veraguas<br>Extension agents, DINAAC, Veraguas<br>Visits to fishpond sites, Veraguas. |
| 29 November | Dr. Richard Pretto, DINAAC, Santiago, Veraguas<br>Extension agents, DINAAC, Veraguas<br>Visits to fishpond sites, Veraguas |
| 30 November | Extension agents, DINAAC, Veraguas<br>Visits to fishpond sites, Veraguas |
| 3 December | Joe Kwiatkowski, AID/ARD<br>Pedro Martiz, AID/HRD |
| 4 December | Dr. Cutberto Parillon, Director of Nutrition Directorate, Ministry of Health, Panama<br>Lcda. Cristina Martinez, Complementary Foods Program, Ministry of Health, Santiago |
| 5 December | Lcda. Viodeldia Gomez, Complementary Foods Program, Ministry of Health, Regional Nutritionist, Santiago<br>Extension Agents, DINAAC, Veraguas<br>Villager interviews -- Rincon de las Palmas |
| 6 December | Extension Agents, DINAAC, Veraguas<br>Villager Interviews -- Buenos Aires |
| 7 December | Extension agents, DINAAC, Veraguas<br>Villager interviews -- Peru<br>Dr. Richard Pretto, DINAAC, Santiago |
| 14 December | Informal presentation of findings to Bob Jordan, Dwight Walker, Pedro Martiz, Elias Padilla and Herb Candill |

## APPENDIX V

Fish ponds visited 28-30 November, 1979

| | | |
|---|---|---|
| 28 November | Gavilan (de la Mesa) | Small pond (we went into the old woman's house here) |
| | Cerro Redondo (de la Mesa) | Large machine dug pond with pigs and ducks |
| 29 November a.m. | (Rincon de) las Palmas | Med.-sized (where the man brought out his list of figures and we went to the Iglesia) |
| | Cerro Pajal | Med.-sized pond with silver carp (near las Palmas) |
| | La Trinidad | 1 small and 1 large pond (where we saw the Guaymi on road) |
| | Los Mendez (de la Mesa) | Small pond (we had to scramble up a little hill here and didn't meet any of the people) |
| p.m. | Los hijos (higos?) de San Jose | Med.-sized pond (where the machine had been left, unused, near the RENARE project) |
| | San Jose | Very large pond; ciclo basico and asentamiento |
| 30 November a.m. | Trinidad -- Rio de Jesus | Large pond with pigs; ciclo basico |
| | Rincon Sucio | Med.-sized pond with a few ducks (man with radio and gold teeth spoke with us) |
| p.m. | Atalaya | Inst. Jesus Nazareno. |

# ALTERNATIVE DESIGNS AND

# COMMENTS ON EVALUATING THE NUTRITIONAL CONTRIBUTION OF FISHPONDS

with Reference to the USAID/Panama
Managed Fishpond Project

A REPORT TO THE USDA NUTRITION ECONOMICS GROUP

By: Jon Hitchings

Under RSSA 3-77 (Economic Analysis of Agricultural Policies) with
the Office of Nutrition, Development Support Bureau, AID

January 1980

This note on research orientation and methodology is an outgrowth of, and a response to, Judith McGuire's consultancy report to the Nutrition Economics Group, USDA/OICD, under contract No. 53-319R-0-45. In the following, familiarity with the project is assumed, and a premium is placed on brevity. (But the paper grew inescapably when budget considerations had to be added.)

## I. ASSUMPTIONS

The task is to evaluate the nutritional effects of constructing managed fishponds in 30 small Panamanian villages, averaging perhaps 30 households each. These assumptions are made:

1. The ponds are not viable unless they are economically self-sustaining after start-up costs; an independent financial appraisal will be made.

2. The ponds are co-op run, probably not achieving 100% participation; information from co-op managers can be gotten independently of a household-level survey.

3. The nutritional concern is protein intake, indicated by poor protein quality and quantity in the diet. (The extension to energy is straight-forward.)

4. The nutritional outcome variable is the change in household protein consumption per consumer equivalent, to be established by surveys. The individual is not the focus, but households are asked whether fish is given to children.

## II. RESEARCH OBJECTIVES

1. Do fishponds boost total household protein consumption?

2. What household characteristics affect the outcome?

3. What community characteristics affect the outcome?

Objective 2 aimes at discovering:

2A. Which households benefit and why?
2B. Are households having the poorest diets reached?
2C. Are fish substituting for other foods?

The substantial expansion of the questionnaire required for determining indirect effects may or may not be warranted:

2D. Are fish altering diets through price effects on other foods?
2E. Are fish altering diets through income effects from changes in labor allocations or private commercial disposal inside or outside the village?

Objective 3 aimes at discovering (partial list):

3A. Should the project be extended to other communities? What type?
3B. Is total pond output relative to village size adequate to effect a meaningful household-level dietary change?
3C. Is the output distributed to co-op members adequate to effect a change? (Important if some fish are sold by the co-op to meet expenses.)
3D. What are the terms of distribution? Free? Concessional price? According to labor input? According to household size?
3E. Is there co-op distribution to non-members in the village? On what terms and what magnitude?
3F. The extent of co-op participation.
3G. The extent and nature of disposal outside the village by the co-op.

There are differences and overlap between Objectives 2 and 3. The household-level investigation is certainly distinct from a co-op and community inquiry concerned with fishpond operation and output, and community-wide characteristics. But note that objective 3 is really compound. Subquestions 3B-3G hold some interest even if one community is studied and no household survey is conducted. Alternatively, answers to these questions at the co-op level may be demanded to explain a "no consumption effect" result from a household survey.

The important issue of extension of the project, contained in 3A, is another matter. The question <u>necessitates</u> the household survey to arrive at one observation of the community-wide consumption effect. One observation cannot stand alone in this expanded context if community-wide conditions are suspected to vary importantly, so a sample of community effects and characteristics must be analyzed together.

Variations in some of the following conditions might require this approach:

1. Pond size relative to the community size.
2. Type of fishpond feed (commercial, village crops, animal wastes).

3. Access to nets, markets, other disposal channels.
4. Co-op participation, management structure, fish-distribution procedures, or harvest frequency. (Do more fish go to larger households?)
5. Productive potential of the ponds due to sunlight, altitude, climate, harvest schedule, size, etc.
6. Proximity to extension services.
7. Preferences and baseline diet: Will more fish be eaten if rice is dominant?

If these factors are deemed important and variant across villages, then pertinent community data must be collected.

The overlap of Objectives 2 and 3 allows some valuable cross-checking of co-op and household figures for:

1. The extent of membership.
2. Labor inputs.
3. Quantities and frequency of fish distribution to the household.
4. Conditions of distribution to members and nonmembers.

Two important transactions which probably cannot be checked by comparing co-op answers with household answers are gift transfers and resale.

## III. THE CRUX

Whether the evaluation is successful may turn on the study's ability to penetrate the temporal and household distribution of fish.

1. Temporal Distribution Timing enters three ways: through seasonality, the production cycle, and storability. The expected best and worst seasons can be treated separately. These are seasons with high or low protein intake from non-fish sources. However, there may be seasonality in the pond production levels. Do experts say output is constant? What about seasonality in level of fish feed if it is derived from crop or animal sources? It cannot be assumed that the yearly average protein intake equals the best season/worst season average, yet stratifying by season is probably sufficient to be highly informative.

Within seasons, the timing of the survey with respect to the last fish harvest is critical. McGuire reports that fish "lasts no more than 10 days after it is

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* In other words, are there variations in the complementarity of the existing diet with fish?

harvested (and dried) and most people used up their allotments in 2-4 days." It is argued that weekly harvests are necessary to significantly alter the diet. Even if they are achieved, there is reason to suspect within-week fish consumption cycles. It is not unlikely that some villages will harvest two or three times a month at best. Fish may displace certain foods to other days and thereby raise protein consumption even when fish is not eaten, but the strong expectation remains of several protein consumption peaks and trailing-off periods per month.

The utter uniqueness of studying a phenomenon potentially having such marked periodicity, (high amplitude, short cycle) must be recognized and built into the research design, in my opinion. Two examples follow; others are plausible:

Example 1: One village is under study, before and after the fishpond. The harvest cycles are 10 days, but most households are interviewed in the "after" survey 5 days since the last harvest. The effect is underestimated.

Example 2: Several villages are compared. Villages further away tend to be visited systematically later in the week, as a result of convenience. This corresponds to being surveyed later after harvest. A particular community variable (distance, altitude, certain crops?) shared by the remote villages is statistically related to a fictitiously low protein effect. The recommendation is handed down not to expand the project to villages with that characteristic in the future.

To really handle this problem, it may be necessary to randomize days of observation somewhere along the line, and (not or) include questions pinning down when the last harvest was. Surveying three days in a row does not suffice since a crucial issue at stake is whether there are biases influencing the beginning of the observation period. Validly sampling the cycles presents its own unique administrative burden.

2. Household Distribution It should be relatively easy to obtain total production. The household distribution is more difficult. Where does it all actually go besides into the kettle? Invisible transfers, gifts, sale or re-sale

by households, sale by the co-op, spoilage, unequal distribution, may all bear investigation. If distribution, by design or default, is at a concessional price to co-op members, some households may purchase more than they intend to consume, lowering the village consumption effect if it is re-sold elsewhere.

## IV. A PARAMETER

About 40 pounds whole fish per week in a community of 100 consumers supplies 4.4 gm protein per person per day. This is about 10% of the pilot study's observed protein intake, including two villages (out of three) already having ponds. This compares with an average weekly yield of 50-70 pounds at a model site in the village of Buenos Aires, Panama. A 10% gain may not be an unreasonably high target.

## V. EVALUATION DESIGN

The stated research objectives require household and community data. Even without the issue of extending the project (3A), community information on the functioning and output of the pond is needed to fully interpret the household effect should no consumption gain be observed. Judging the project's nutritional success in terms of community characteristics entails a further expanded set of village data, as sketched above.

Testing the statistical significance of a protein consumption gain should involve a careful examination of what is the unobserved dimension requiring generatization. Another approach to the same issue is to ask "What is being randomized and sampled?" McGuire advocates surveying all households in the community. If they are all included, there is no need to infer or generalize the result to other community members. There are no unobserved households, and there is no need to randomize a 100% sample. The "significance level", in this context, gauges the

likelihood of the outcome if all observations were included. In this sense it is superfulous.

Likewise, if the universe of interest is all communities in the project, and they are all surveyed, as recommended in McGuire's report, then the question of sampling and significance again does not arise viv-à-vis unobserved project villages. The "universe of interest", however, might be all villages which might become project sites or fishpond sites in the future. Then the question is whether the villages chosen in this project are representative of others that may be of interest.

The other unobserved dimension is consumption by households on days not surveyed. Have they been adequately sampled? The above comments on the periodicity of fish consumption expose the need to avoid biases in the days of observation. Three possibilities are::

1. Some randomization of the days of observation;

2. Weighting the consumption effect of different days according to the time since the last harvest and the number of days at that level represented; This may require prior knowledge of the timing of harvest, and some drop-off-in-consumption estimate. If we knew harvest was on Monday, and consumption (of fish) would tend to be high and constant on Monday and Tuesday, low and constant on Thursday through Sunday, weights of 2 and 4 for observations on Tuesday and Friday might yield a good weekly figure. (Wednesday is assumed to be in between.)

3. Spreading the households surveyed through the harvest cycle. This may give a good community figure (under certain assumptions), but it could present problems for analyzing household characteristics. Since no household by itself has a representative level of fish consumption (if indeed it tapers off after harvest and has marked periodicity), spurious household characteristics might be held accountable for variations. A partial correction might be possible if a question on lapse time since harvest is included.

Perhaps periodicity of intake and the biases of days of observation are not as severe as these reflections imply, but a strong prima facie case can be made that it demands some careful consideration.

Probably all communities should be observed if 1.) one goal of the evaluation

is to decide whether the project should be extended to other villages; 2.) important community-level variables are believed to vary significantly; and 3.) the communities in this project are representative of others, within or outside of Panama, that might become fishpond sites. Even with all villages in the study, N equals 30 communities. This means that at best, maybe one to three characteristics will emerge as important predictors of what type of village a pond is likely to affect nutritionally, assuming some successes and some failures. Discriminant analysis would be possible. If this technique is used, villages would be grouped into "large protein gain" and "small protein gain" categories, and a dummy variable indicating this classification would be the dependent variable. The difference in protein consumption, before and after the pond, at the community level, is used to place villages in categories. The technique is more appropriate if the outcomes are bunched (clear successes and clear failures), but the level of gain that qualifies a village for inclusion into the "large effect" or "success" category can be set arbitrarily or in conjunction with nutritional considerations. An 80-100% household sample within villages is recommended.*

If no extrapolation is required (objective 3A is dropped) and only the present project is being evaluated, then a 100% community sample (all villages) is probably not necessary. Fifteen or twenty villages, chosen at random, should give a good idea of the impact of the project on protein consumption. Sampling no more than half of the households in each, a t-statistic based on a household N of 225 would suffice for the total picture. Each variable in this test would be the household difference (paired), and the SD would have to be computed on the set of household differences.

Any investigation of household characteristics affecting the outcome will probably require merging villages. If regression is used, for example, (there are assumed to be no more than 30 households per village on average) even a 100% sample would allow only one or two explanatory variables to be included if a single village were studied. Regressions might be performed on households merged into two or three

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* This approach does not depend on household pairing.

different classes, varying on some important community-wide characteristics, or some community variables (pond area in square meters per co-op member?) might enter a regression of all households combined. In either case, the dependent variable would be the household difference in protein consumption per consumer equivalent.

In conclusion, studying either household characteristics influencing the protein effect, or the total success of the project, may not demand a 100% sample of the villages, nor a 100% sample of households within. Projecting the impact of future fishponds may require a 100% village sample, a nearly complete sample of households within each, and the assumption that the villages the project enters are representative. The ability of the evaluation study to validly represent the short-term cycles in fish consumption that are expected, and to penetrate the distribution of output, will largely determine its utility.

It may be advisable to have a long-term follow-up survey of a few villages providing more than the 18-month perspective afforded by McGuire's suggested design. Since the construction of ponds is phased in over three years, the survey teams will still be operating in some villages long after the first ponds are in operation. This facilitates a later follow-up of the communities where ponds were first introduced.

## VI. ALTERNATIVE PROPOSALS

### HOUSEHOLD ANALYSIS

Although randomizing the days of observation is the most appealing solution to the periodicity of intake problem from the conceptualization and analysis standpoint, the logistical and administrative difficulties may seem insurmountable. A key parameter is the harvest cycle length from which days would be sampled--the longer, the more burdensom. Barring this approach, combining possibilities two and three may be a "second best" solution. Three successive days of observation would be made to overcome day-to-day variations in intake, as under McGuire's Option A. The three-day periods would be spread across the harvest cycle by design, so that some households would be observed during, just after, and long after harvest, and at the midpoint between harvests. Hopefully this will yield a fairly accurate village average intake over the cycle. The problem of spurious household characteristics being held accountable for differences in household level intake, which are actually due to the time factor, remains. However, the questionnaire can obtain information on the time since harvest, the storability of fish, and changes in intake through time. The two most apparent methods of using this information to correct for biases would be either to include the number of days between harvest and the survey as an explanatory variable in a regression analysis, or to estimate a "drop-off in consumption" function and use this to impute average levels of intake over the cycle. The cycle lengths would be expected to vary between villages, and again, this question of periodicity gains importance when the cycle is long. It may not be such a problem if a weekly harvest schedule is actually followed. Without due care, there will be a troublesome tendency to gather information from the households which

only reflects the periodicity issue without being appropriate to use directly in the consumption-effect analysis. The questionnaire must be designed with the specific type of analysis in mind to minimize the amount of less-usable secondary-type data.

It is possible that high protein foods will be displaced by fish in the sense of being consumed later after harvest once the fish has been used up. This will of course mitigate the periodicity of protein intake. However, a working hypothesis is that fish intake at least, and maybe protein intake, may have a quadratic drop-off functional form. So it may be worth pointing out that the time since harvest (number of days) and probably its square, would both be appropriate in a regression.

It has been suggested that for evaluating the nutritional impact of the project, something less than a 100% sample of households in villages may suffice. In some cases, it may be cheaper to survey all households than to trace household I.D.s to find a particular sample. For what village size is the trade-off equal? McGuire's report assumes a census of households has been made prior to the survey. I would suggest, as an approximate approach, including all households in villages under 40 in size, and half of the households in larger villages. This should not introduce any new wrinkles in the question of whether to weight observations when households from several villages are combined for analysis. The villages would not be equally represented in McGuires"100% of all villages" recommendation anyway. If some villages are large and households are unweighted, the proposed modification would reduce over-representation as well as cost (presumably).

I am dubious of the merit of collecting income and expenditure data for the purposes at hand. Curtailing the scope of the questionnaire in this respect would also lower cost. Neither this suggestion, nor the recommendation to survey half of the households in large villages are costed out in the budget estimate that follows (after village analysis). A guess as to the cost of

spreading observations throughout the harvest cycle is made. The main cost increases would accrue from more time and more travel.

In the pages that follow, Options C and D are added to McGuire's A and B for survey design. C and D both include the suggestions made above, and it should be kept in mind that some of these modifications will lower costs, although this has not been included in the budget estimates. The main difference between C and D is in reference to the number of villages visited. D is geared to including objective 3A (inferences about future projects) in the design, and therefore requires a larger village sample than needed to just evaluate the one project. The village differences between C and D are elaborated on below. The main reason for not recommending changes in the household sample size, comparing C to D, is the inefficiency of hunting down and sampling large portions of small villages when a 100% sample may be easier.*

Both C and D envisage a long-term follow-up of villages that first had ponds constructed, probably in 1984. This is considered extremely important to realistically evaluate the project's impact. The impact in the first year after construction may not look like the years to follow. Taking only one of many examples, have the ponds silted up without being re-dredged?

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* If village sizes ranged from 100 to 200 households (many times larger than in Panama), for example, then it might make sense to sample 30 households from each for the purposes of C, and a larger number for D, or if household analysis within a village (instead of villages combined) were of interest.

VILLAGE ANALYSIS

The following is one possible approach to studying village characteristics as they influence the success of fishponds.

Two questionnaires would be drawn up, called the "Village" and the "Co-op" survey forms. The first would record the more stable features of the village such as location with respect to roads and markets, access to advice from fishpond extension agents, the number of households, the proximity to non-agricultural employment possibilities, e.g. in semi-urban or urban areas, fixed factors that may affect fish pond productivity such as altitude or temperature, the fish pond size, and the like. A physical measurement of the fishpond may be necessary. (Circumference and depth?)

The "Co-op" form would be administered to the fishpond managers asking about co-op participation from the village (How many households?), the fish feed inputs to the pond, harvest frequency, yield, distribution schemes, labor inputs, nets, etc.

Under Option C, Confined to a project evaluation, the Village form would be used 30 times: all 10 of the first series of villages would be surveyed at the time of the Winter Post Test (Household) Survey; 5 of the second-series villages and 5 of the third-series villages would be surveyed at the time of their Winter Post Test Surveys; and the first 10 villages would have a repeat visit in January and February of 1984 for a long term follow-up.

The reasoning for this suggestion is:

a.) Without extending the total length of the evaluation, only the first villages in which ponds are constructed are candidates for a long-term follow-up. Since there are so few of these, all 10 should be included. This means using the form in 5 first-series villages from which no household information is sought under Option C, at the beginning, and late into the project.

b.) The village characteristics of interest are not likely to change seasonally, so this form does not need to be completed in both seasons; however, they may change by the time of the long-term follow-up, so it is repeated then. Access to markets is one such characteristic that may change.

c.) The Village Form cannot be given during the pre-test survey since the pond size, and perhaps depth, if this is not standard, are being treated as village characteristics.

The Co-op Form would be given whenever the Village form is given. In addition, it would be given in the second season during the Summer Post Test Household Survey. However, it would only be given once during the long-term follow-up, since the household long-term follow-up surveys are only given once. It is assumed that in general, output, participation, and distribution information from the co-op will be of interest in both seasons.

Under Option D Option D requires all villages to be included so that the sample is large enough at the village level to extrapolate from to other possible fish projects. The protocols for the Village and Co-op Forms would be the same, but would be applied to all second and third series communities.

A reproduction of McGuire's Timetable, found on the next page, conveys the overview in simpler terms than the narrative approach above. "V" has been written in for the Village Forms, and "C" for the Co-op survey. The long-term surveys have been added under 1984. However, the timetable does not distinguish between Options C and D with respect to whether half or all of the second and third series villages enter the analysis.

# Timetable for Expanded Survey Design

V = Village Characteristics Survey
C = Co-op and Pond Operation Survey
(A long-term follow-up household survey has been added.)

| | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|
| | M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D |
| POND SERIES I | Summer Pre Test Survey I | Install 10 Fish Ponds → NEED ALL FOR LONG-TERM FOLLOW-UP. / Winter Pre Test Survey I | Winter Post Test Survey I; V+C | Summer Post Test Survey I; C | (V+C) → ADDED: Long-Term Follow-Up Household Village, and Co-Op Surveys, 10 Villages. One season, determined by review of earlier returns. Preparation of Final Report |
| POND SERIES II | | Summer Pre Test Survey II | Install 10 Ponds / Winter Pre Test Survey II | Winter Post-Test Survey II; V+C | Summer Post-Test Survey II; C |
| POND SERIES III | | | Summer Pre Test Survey III | Install 10 Ponds / Winter Pre-Test Survey III | Winter Post Test Survey III; V+C | Summer Post Test Survey III; C |

Assumes prior census in each villagd with enumeration (1980) or concurrent census & enumeration with first pre-test survey in each village.
Assumes Fish ponds can be dug only in January-March.
Assumes 10 fish ponds will be built each year for 3 years starting January 1981.
Assumes Fish ponds require 3-4 months to reach capacity production (minimum requirement for post-test is weekly fish harvests)

## VII. BUDGET

### A. Notes on McGuire's Budget

A partial budget is given on p. 34 of McGuire's report. The interview and coding cost for her Option A is given as $43,500 and for Option B, $20,800. The author states these figures are exclusive of expenses for cars, gasoline, and fixed costs, which she does not attempt to estimate. Fixed costs include training for interviewers, analysis, report preparation, the project director's salary (full time for four years), etc. It is unstated in the report, but she has figured all labor at $7.50/day, including drivers, per diem's at $7.50/day, and equipment at $50.00/set. Coders do not receive per diems. Her calculations assume 25 households per village, and the census costs are external. It should be noted that no costs are included for questionnaire preparation or testing. There will be a significant amount of manual or computer matching of household questionnaires which will add to the cost of analysis.

### B. Alternative Budgets

Using the same set of assumptions, wage rates, and limitations, a very rough idea of the interview costs of other alternatives, Options C and D, can be worked out. In both C and D, it is planned to interview households for three consecutive days per season, as in McGuire's Option A. This is probably necessary to overcome day-to-day variation in intake. Both C and D envision Village and Co-op surveys, and a long-term follow-up in ten villages including a one season repeat household survey. Option C considers only five out of ten of the second and third series villages. This reduces the total number of surveyed villages by a third. Option D, recommended for analysis extrapolating beyond simple project evaluation to find village characteristics conducive to

success at other fishpond sites, would survey all the villages. The suggestion to drop detailed income and expenditure portions of the household survey is partially off-set by requiring more information about the use and disposal of fish and the timing of the last harvest. Some budget savings may result, but the recommendation follows from the belief that given the intake data and the purposes of the evaluation, it is unnecessary. There will be a savings in terms of coding and analysis from its omission, again partially off-set by the additional village and co-op data that I am recommending be collected. Is it really the intent of the evaluation to perform thorough economic analysis of expenditure patterns and income?

The follow-up of the first series of villages in 1984 may cost about $3,500 for the interviews. This is similar to the 1980 expense of the first visit to this group of ten communities. Spreading the interviews through a harvest cycle is going to mean more time and transportation. As a guess, this may escalate costs 30-50%. Let's pick 40%. Two partial budgets for interviews would be:

Partial Costs of Interviewing and Coding

Option C

| | | |
|---|---|---|
| | $43,500 | McGuire's Option A figure |
| - | 14,500 | Dropping 10 Villages (One third) |
| | 29,000 | |
| + | 11,600 | (40% added for spreading interviews throughout fish harvest cycle) |
| + | 3,500 | Long-term-follow up of first 10 villages, Household For |
| + | 1,300 | Village and Co-op Surveys (See Below) |
| TOTAL | $ 45,400 | |

Option D

| | | |
|---|---|---|
| | $ 43,500 | McGuire's Option A Figure |
| + | 17,400 | Spreading the Interviews adds 40% (assume) |
| + | 3,500 | Long-Term Follow-Up |
| + | 1,800 | Co-Op and Village Surveys (see Below) |
| TOTAL | $ 66,200 | |

Assumptions underlying Co-op and Village Survey Costs (Interviews Only):

Option C: 20 villages + 10 repeats = 30 Village Forms filled out
50 Co-op Forms (More since seasons)

40 Interviewer days
40 Driver days
10 Coder days
80 Per Diems

Assume one village and one co-op questionnaire per day.
When doing seasonal co-op forms, assume two per day.

Option D: 30 villages + 10 repeats = 40 Village Forms
70 Co-op Forms

55 Interviewer days
55 Driver days
15 Coder days
110 Per Diems

It is expected that compared with the household level survey, a substantial amount of village characteristic and co-op data can be collected at low cost. Whether co-op records of pond output are kept may be critically important. Distance wheels or some other equipment may be needed to figure out pond area (the area can be found from the circumference if round). There are no additional equipment costs in the budget.

These interview budget guidelines have made some heavy assumptions and are totally dependent on McGuires figures and additional assumptions. Are they

informative or believable?

The consultant believes $7.50/day (50-80% above agricultural work) is reasonable for interviewers. Whatever does apply, it should probably be above the rate for drivers (McGuire has assumed the same wage). Only a pre-test will tell if six household interviews per person per day is reasonable. One village and one co-op form per day is a less strenuous pace. The 40% added on for spreading the timing of the household survey is pure speculation. There is no contingency allowance in the budget, nor additional time for repeat visits to locate missing respondents.

NOTE: Before launching into an evaluation of the protein impact of the project, in my opinion, there should be a clear demonstration that protein is a distinct, widespread (in target villages) and important nutritional constraint. The apparent heavy reliance on tubers is suggestive.

-- END --

ANNEX XIII

# ORGANIZATION AND MANAGEMENT
# OF NATIONAL DIRECTORATE OF AQUACULTURE
# (DINAAC)

Prepared by: Anthony J. Ormasa

May 21, 1980

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## I. Introduction

This report is submitted pursuant to the provisions of AID Contract 525-412T which states:

A. Objective: to assist the Government of Panama in organizing, coordinating and implementing effective aquaculture programs.

B. Description: the contractor shall work with and assist the Director and Staff of the Directorate for Aquaculture (DINAAC) of the Ministry of Agricultural Development.

1. Review the present authorities and responsibilities of DINAAC as established by current Government of Panama aquaculture policies and programs.

2. Develop a plan in which the organizational structure and administrative responsibilities within DINAAC are delineated in a manner which will enable it to effectively plan and implement aquaculture activities, including, construction and management of hatchery ponds, laboratory research, demonstration ponds, training and extension, which are included in a grant proposal to be submitted for consideration of USAID.

3. Assess the current effectiveness of conducting extension activities through MIDA's regional offices, and if necessary recommend ways in which extensions might be made more effective.

4. Recommend staffing requirements and staff training necessary to permit MIDA to plan and implement a natural agricultural program.

5. Evaluate current procedures for the procurement of goods and services and recommend changes if necessary.

6. Analyze alternate administrative mechanisms for operating a revolving credit fund for integrated swine-fish production and recommend the

most feasible alternative.

7. Develop a preliminary scope of work for an administrative study to be conducted as part of a Managed Fish Production project.

The study will evaluate the effectiveness of alternate arrangements for program administration which will be tested during the project.

II. Summary of Findings and Recommendations:

1. The National Directorate of Aquaculture has a most adequate current legislative base to enable it to plan and develop - flexible programs in aquaculture consistent with the funds made available to it.

2. The establishment of separate Departments of Aquaculture in the Regional Directorates of the Ministry of Agriculture to serve as implementing agents for programs of DINAAC is considered conceptually sound and feasible. However, these must be kept separate under the supervision of the Regional Director and not be integrated into other Departments at Regional level having other programs.

3. The current organization structure of DINAAC is considered appropriate for the immediate future.* Suggested functional statements for the national organization and regional aquaculture departments have been prepared as guides for use by DINAAC and are included in Appendix 2.

4. There is need for a formal internal communication system. The development of that system and the coordination of its operation should be assigned to the Department of Administration.

5. A chief, Department of Transfer of Technology should be recuited as soon as feasible to make this Department more effective and eliminate the necessity for the Director, DINAAC to serve in that capacity.

6. The Department of Transfer of Technology should undertake a more organized approach to the development and publication of technical guides and standards for program implementation and materials for training purposes. Technical assistance should be provided to assist in this effort and to train the personnel involved.

* See Appendix I

7. It is advisable to increase the functions of the Programming and Evaluation Department to include the coordination of program and project planning, including the preparation of the investment budget and to establish and coordinate an effective system of program evaluation in cooperation with other appropriate departments.

8. A high level person with an economics or program planning background should be recruited to serve as Chief of the Programming and Evaluation Department. Preferably the person should have an English Language capability since he will be required to work with representatives of international agencies.

9. A review should be made of the administration of the current statistical reporting system and detailed instructions for its operation should be prepared. This responsibility should be assumed by the current employee of the Programming and Evaluation Department.

10. The assignment of regional extension personnel should be based on coverage of a specific geographic area within the province. For their area of coverage they should be required to pre-plan a schedule of visits to individual projects at least on a monthly basis.

11. The role of the individual aquaculture agent, due to the nature of the individual projects and clientele being serviced, is that of an implementing agent and not simply advisory, thus requiring more "doing" or "seeing that its done" than might normally be considered as advisable, if individual projects are to be successful.

12. There is need to provide time for an orderly development of relationships between the National Directorate and its Regional counterparts. Accordingly it is suggested that no more than four provinces readily accessible to national headquarters be included in the Directorates program.

13. Current program support funds for transportation, gasoline

and other materials such as nets are inadequate. This will seriously handicap program implementation unless remedied.

14. There is a shortage of vehicles for transport of personnel as well as supplies. This is considered critical in view of the extensive field operations involved in project implementation.

15. Although the Ministry has a procurement capability in its centralized administrative services, individual purchases are subject to significant delays. It is suggested that an exception to normal procurement procedures similar to that obtained by the Directorate of Indigenist Affairs be secured to administer the funds made available by the USAID grant.

16. It is suggested that the internal communication system to be established consist of the following: a) staff bulletins, b) program guides and instructions and c) administrative instructions.

17. Current space utilized by DINAAC in Santiago is minimal and not conducive to efficient operation. More adequate facilities would be helpful.

18. It is not considered feasible for DINAAC to acquire its own heavy construction equipment as a means of reducing costs of the larger pond construction projects. Rather it is believed DINAAC should attempt to negotiate lower rates from ENDEMA or others for the use of their equipment.

19. There is need for providing the services of a secretary at regional level who in addition to providing typist and other office services could maintain the records on fish seeding, feeding, harvesting and related statistical data.

20. The employment of a para-professional level personnel residing in relatively inaccessible outlying areas to provide services for projects in the area should be given another trial. Careful orientation should be given prior to their initiation of activities.

21. Further study is required of the needs for training of fish pond project operators or managers to better define the subject matter content and to tailor training programs and materials to a level consistent with their ability to absorb the instruction.

22. Periodic meetings of 1 to 2 day duration, based on a pre-planned agenda should be held at least once every 2 months with the participation of all regional personnel and key central staff personnel. Such meetings would be held to develop closer working relationship with the regional personnel and provide on the job training.

23. DINAAC should review the current practice of distributing fingerlings, plastic bags, feed etc. on credit for individual projects and issue instructions as to the nature of the collection activity which should be undertaken by the Regional Office. Care needs to be exercised to assure such collection activities do not adversely affect the other more important and critical function of these offices.

24. It is preferable that any small loan program instituted for fish-swine production projects be administered apart from the DINAAC program especially through cooperatives should that prove feasible.

25. Assuming any small loan program must be administered within the government structure, the program must be executed at Regional level under the policy guidance, review and audit of the central DINAAC staff.

## III. Legislative Base

The National Directorate of Aquaculture is a small relatively new organization which has been functioning only since 1976. Its current legislative base was established by Decree #16 of May 11, 1979 which superseded Resolution #640-AP of June 15, 1978.

The contents of Decree #16 are as follows:

DECREE #16 - May 11, 1979:

By which the National Directorate of Aquaculture of the Ministry of Agricultural Development is created.

The Vice-President of the Republic in charge of the Executive Branch

Decrees:

Art. 1: There is established the National Directorate of Aquaculture of the Ministry of Agricultural Development which will have the following functions:

1. Formulate and execute the projects and experiments in aquaculture with native and exotic fish in order to guarantee the highest quality of life of the same in sweet, salt and marine waters.

2. Make economic feasibility studies and selection of areas for activities in aquaculture.

3. Establish and manage fish factories and ponds to supply the demand for fingerlings of aquatic organisms for its intensive raising and repopulation in Continental waters.

4. Make studies of native species emphasizing those with potential in aquaculture and repopulation of continental waters.

5. Establish the sources of agro-livestock and marine products suitable for the preparation of diets of acuatic organisms.

6. Make socio-economic analyses of the activities in wich the National Directorate of Aquaculture is involved.

7. Prepare information material relating to aquaculture in coordination with the National Information Directorate of the Ministry.

8. Prepare and put in practice plans for the training of personnel in aquaculture with the end of maintaining the highest grade of qualification in the units which render these services to the program of the Ministry.

9. Set forth the management of the aquatic species which are found in continental waters of the country (canyons, small rivers, rivers, lakes, small lakes, dams and mini dams) jointly with the National Directorate of Renewable Resources.

Article 2: this decree will be effective upon its promulgation.

Communicate and Publish It.

Given in the City of Panama on the 11th day of the month of May of 1979."

As can be noted from the above this Decree grants the Directorate a broad general charter in the field of aquaculture which is most adequate for the administration of the aquaculture programs of the Directorate.

## IV. The Organizational Environment

### A. The Ministry of Agriculture Development

To properly comprehend the role and authority of the National Directorate of Aquaculture within the Ministry of Agricultural Development an understanding of the organizational environment in the latter is essential.

The programs of the Ministry, as currently organized, are basically implemented at Regional level. The Ministry being divided into 10 regions covering all geographic areas of the country. Thus the Regional Director and Regional Office become key factors in the execution and administration of national programs of the Ministry.

The Regional Directorates in turn are sub-divided into organizational units corresponding to the Technical Directorates (to be discussed later) existing at national level. These units then are the basic implementing arms of the national programs. Annual budgets are established for them at Regional level which in turn set forth the level of implementation which can be attained.

It is at this level that the competition between programs for available program implementation resources is initiated.

As indicated previously, at national level, the Ministry is sub-divided into approximately 10 technical directorates in such matters as agro-industry, agriculture production, milk development, agrarian reform, cooperatives, and indigenist affairs. Each of these national directorates report to the Minister and Vice Minister.

The National Directorate of Aquaculture is one of these Directorates.

It is the role of these Directorates to establish national policy covering the activities under their jurisdiction to plan and recommend the scope of national programs; to provide the technical standards and guidance under which their programs are to be executed at regional level; to assure proper training of regional personnel to enable them to carry out their mandate, to perform functions unique to the national level such as research, to supervise or monitor the activities of the regional offices, to evaluate the effectiveness of the programs and to secure adequate funding for programs at both national and regional level. To service these technical National Directorates, as well as the Regional Directorates, and to maintain management and financial controls for the Ministry, the Ministry has established central staff offices under the direction of the Minister. Thus such services as procurement and supply, finance and accounting, personnel, printing, maintenance and repair are centralized.

It is within this environment that the National Directorate of Aquaculture operates. Specific details of importance will be discussed later.

B. The National Directorate of Aquaculture.

With reference to the National Directorate of Aquaculture, its current programs are concentrated in two major areas, fresh water fish production and salt water shrimp production; the latter is in an early financing and formative stage requiring additional planning and construction of facilities before it is fully operational.

The specific services unique to the National Directorate which are executed on a national level are the operation of the fresh water research and fingerling station at Divisa, the laboratory operation also

located physically at Divisa, the research and shrimp production station at Aguadulce, now under construction, and the shrimp hatchery planned for Punta Chame as well as the hatchery Gamboti, in Panama City. These are or will be administere directly as components of the National Directorate. With respect to other current or planned activities wholly related to fresh water fish production such as pond construction, seeding and feeding of fish, their harvesting, promotion and organization of individual projects etc. which involve program implementation, these are or will be the responsibility of the Regional Office. The Offices of the National Directorate thus would be concerned with establishing policies to govern program activities, for example the selection and approval of individual projects, technical guides and standards for fish pond and other facility construction, the technology of fish production, training of staff at both national and regional level as well as pond operation personnel, assuring appropriate financing, monitoring of the implementation of projects by the regional offices and evaluating such activities.

It is within this conceptual framework, which is considered feasible and in some aspects advantageous since it can draw upon the services of other technical regional departments, that the current organization and functions of DINAAC have been reviewed and analyzed.

C. Internal Organization and Structure:

The current organization structure which is set forth in Appendix I is considered appropriate for the immediate future. Suggested written functional statements, Appendix 2 for each of the major organizational subdivisions including those in the regional offices have been prepared as guides for use by DINAAC, as none exist at present.

D. Specific Observations and Comments

In some aspects the preceding organizational structure and functions are not fully operable at present. Accordingly the following additional specific comments are made:

1. Department of Administration - There does not currently exist, other than by oral communication or memorandum, an organized formal internal system of communicating policy, guides or standards whether on program or administrative matters, nor has responsibility for such been assigned within the organization. Accordingly it is suggested that the responsibility for the development and coordination of a simple internal communication system for policy, technical operation, program and administrative as well as other matters be assigned to the Department of Administration.

2. Department of Transfer of Technology

A key factor to the successful operation of the organizational concepts set forth above is an effectively operating Department of Transfer of Technology to develop the technical guides for use by regional personnel, to maintain liaison with the regions and to review and evaluate their operations as well as conduct training programs.

At present the Director of DINAAC serves additionally as Acting Chief of this department. It is believed that this practice should be discontinued as soon as feasible and that a Chief of Department should be recruited to serve full time in that capacity.

Although some work has been done in preparing a manual

on fish production techniques and standards it has not been published to date. Similarly there appears to be a need for the development of published training materials not only for the Regional staffs but for personnel who participate in pond operation and management as well as swine and/or garden operations.

Responsibility for parts of this activity could be assigned to the current staff member of the department.

In view of the importance of this department and its need for a more organized approach to the preparation and publication of technical standards and guides as well as training materials it is suggested that external technical assistance be provided to this department. The advisor could render valuable services in getting it to assume its proper role effectively.

3. Department of Programming and Evaluation.

The current operations of this department can best be described as involving the preparation of regular and special reports on current or projected programs and projects and for the maintenance of statistics. It is not involved in a major role in the development of operating or investment budgets or in program evaluations. There is need to strengthen this department to enable it to carry out the functions suggested in the functional statements.

In a visit to Region 4, the Chief of the Aquaculture Department indicated that he had not submitted a monthly report in the last 3 months. Additionally, as part of the visit, he was given 4 different statistical cards by a staff member of the National Directorate on varying aspects of fish producti which it was suggested he should maintain but he has not given any instructions, oral or written

as how to maintain and utilize them. These actions indicate a need for a comprehensive review of the current reporting system and its administration as well as for clear cut written instructions. To strengthen this department it is recommended that a high level Chief of Department having an economics or program planning background be recruited. The present incumbent could then concentrate on special reports and on the improvement of the reporting system.

4. Regional Offices

Current operations are concentrated principally in Veraguas and Cocle provinces with the former being the principal center of operations. The Veraguas office has been a part of the Regional Office only since the first of the year and for the current year is being funded by the National Directorate. It is contemplated that funding for next year will be included in the Regional budget.

The Veraguas Office is staffed by seven extension personnel and the Coclé Office by two.

Both offices are beset by administrative problems which will be discussed elsewhere in the report.

In neither office does one get the impression that there is a pre-planned orderly scheduled system of periodic visits to the projects in existence or under construction which is essential to successful implementation. In addition it appears that the personnel have a tendency to return to headquarters nightly. This involves not only a loss of time but waste of gasoline, a critical point in view of the limited finances available for such purpose.

A system whereby the individual employee would be assigned

responsibility for a specific geographic area within the province, and be required to develop a monthly schedule of visitations to the individual projects with reference to the geographic area within his zone of responsibility might tend to minimize the above deficiencies.

As the supervisory implementing agent for individual projects and considering the nature of the clientele being serviced, the role of the Regional Aquaculture Departments should be considered as being more than simply extension. From the promotion and organization phases through the actual harvesting of fishing or the marketing of swine they will be in the role of "doers" or "seers that things get done" and not simply advisors and promoters. Possibly more than normally desirable but essential to obtain project results. This will take skills other than technical knowhow and should be included as part of the training program.

In view of the recency in time in which the Regional Offices have assumed the implementing role, the current limitations of the Transfer of Technology Department, the limitation of funds for support of the program it is believed the fish production activities should be limited to no more than four provinces readily accessible to the headquarters in Veraguas in the near future. This will allow for an orderly development of relationships between the national office and the regional counterparts and for their consolidation.

## V. Administrative and Program Support Considerations

The following comments are made with respect to some of the principal administrative and program support considerations.

A. Budget

The current operating budget for DINAAC is $182,596 of which approximately 87% is for personnel costs.

The investment budget provides an additional $ 150,000 which consists of $50,000 for the station at Divisa and $100,000 for the shrimp facility at Aguadulce.

In viewing current operations the most serious problem is considered to be the adequacy of financial support to enable DINAAC and the Regional Offices to carry out their activities. This lack of adequacy of financial support is reflected in a shortage of vehicles, lack of equipment such as nets, and shortage of gasoline and diesel for administrative as well as program purposes. For example the current appropriation for gasoline is identical to that of the previous year despite rising gasoline costs and the probability of further price increases. Unless financial support can be increased substantially the problem will get worse and severely handicap field operations. To illustrate a pond project in Region 4, to be carried out with the cooperation of RENARE wich would provide the tractor, cannot be executed for the lack of funds for 500 gallons of diesel. The radio promotion activity of Region 2 has been discontinued due to the lack of funds. The Director of DINAAC is taking action

to remedy this situation. Particularly at Regional level the adequacy of funds especially for gasolineand diesel is critical

B. Vehicles

The national headquarters in Santiago has only two vehicles one for the Director and one for the Assistant Director.

These vehicles, procured under the Plan Vehicular, are generally not available to other personnel in the Santiago office. Since DINAAC is located physically apart from the Ministry headquarters and that of the Regional office in Santiago personnel of the Administration, Transfer of Technology and Programming Departments work under handicap in executing their responsibilities. A vehicle operated on a pool basis would lessen this problem.

The Cocle office, Region 4 has one vehicle for two people. Accordingly they must travel together. Since one of the persons is, in a sense, in a training situation temporarily this does not present a major problem but will with program expansion.

The Region 2 office has 3 vehicles for seven personnel. Unless the number of vehicles can be increased some type of pool operation will be required if personnel are to be fully utilized. Additionally, if the pond operation training activity is undertaken, transportation for these participants will be required.

In summary DINAAC is confronted by a major shortage of vehicles essential in its field activity.

C. Procurement

Procurement services, for the most part, are centralized in the Ministry. The procedures which must be followed are set forth in Appendices 3 and 4 which show the steps involved.

The Ministry does have a capability to procure. However, there appears to be a problem related to the time required to make such procurement which is not unusual when services are centralized Several months are often required to make purchases of items available in the Panamanian market. An example cited was a two month period to acquire a radio antenna for the Director's vehicle.

The implication for DINAAC is that in initiating procurement and in scheduling its work on projects it must anticipate the long lead time required for delivery of its purchases if required to follow current procurement procedures.

The Director of the Directorate of Indigenist Affairs advised that that Directorate also had experienced significant delays in the procurement for its program.

As a result of vigorous representations it had been granted an exception to the normal procurement procedures which are greatly facilitating their operations. Essentially

the changes involved were authorizing the Directorate to secure its own bids and select the appropriate bidder and the assignment of an internal auditor full time to the Directorate who could give on-site financial approval and check preparation. Signing of checks could then be done at Ministry level following regular procedures, allowing the Directorate then to pick up its purchases from the vendor. A similar procedure would appear to be appropriate for the administration of the grant funds proposed under the USAID Project.

It is understood that the same probelm does not exist at Regional level, at least at Region 2, in view of the fact the Region has its own administrative and financial services which are readily available to the technical departments. Consideration should be given to granting them a revolving fund to be utilized under the direction and review of the administration department of DINAAC

With respect to vehicle procurement present GOP procedures require Presidential approval. Obviously this further delays the procurement process. It is suggested to avoid substantial delays in vehicle procurement under the USAID grant, that USAID do the procurement.

D. Internal Communication

As a relatively new small organization with a need for flexibility in its operations it is natural that its administration has developed on a personal and informal basis. However, with the shift of the program implementation activities to a Regional basis there is a need for a more organized and systematic method of importing policies, program and administrative directives to the staff of the national office and the regions. As a first step a simple system of internal communication should be established. It is suggested that

it could consist of the following series:

1. Staff Bulletins - These would cover items of general coverage, one time or temporary nature e.g. requirement of a special report, changes in work schedule.

2. Program Guides and Instructions

These would cover permanent guides or instruction on program or project matters. To illustrate the records to be kept and the procedures to be followed in their maintenance, monthly reporting requirements and the items to be included therein, and guides for the feeding of fish on varying sizes of ponds.

3. Administrative Instructions

These would cover such matters as procurement and supply procedures, administration of special funds, and other pertinent administrative matters. This would be numbered consecutively.

E. Space

The space occupied by DINAAC in Santiago is minimal consisting of three offices and a supply and file room. The Director and Assistant Director share one office, the three members of the Administrative Department another, with all others sharing the center office which is also the entrance

for visitors to the office. From time to time a game of "musical desks" is played as outsiders, field or other personnel visit the office. Although not critical to the program a better space situation would be helpful to overall administration.

Region 2 is presently operating out of a desk outside the Regional Directors office. It is understood this is a temporary situation and that funds have been made available for more adequate space. Space in Region 4 is adequate for its present level of operations.

F. Equipment Rental

The construction of the larger ponds requires the use of heavy construction equipment the cost of which is a major component of the total cost of the individual project. The principal sources of procurement of such equipment appear to be rental from Endema, a dependency of the Ministry of Agriculture, La Victoria Sugar Corporation, under policy guidance of the Ministry, private contractors or cooperative action with another government agency having such equipment such as RENARE.

Cooperative action can be probably achieved at lower cost although its availability would be less frequent and not to be depended upon on a regular basis.

The services of the Sugar Coorporation can be obtained at approximately $11.40 per hour. However to receive this rate the beneficiaries, are those involved in the pond operation,must work a certain number of hours for the Sugar Corporation.

Endema charges at least $26 per hour plus the cost of transportation to the work site.

It has been suggested that DINAAC be given its own heavy equipment and directly operate it. However a single tractor would probably result in its use principally in one province,

thus not resolving the problem for other areas. Additionally experienced personnel are required to assure proper use, maintenance and repair of such equipment which is easily damaged if not operated or maintained properly. Without maintenance facilities DINAAC would be dependent on an outside organization such as Endema for other than routine maintenance. Thus it is not considered feasible for DINAAC to acquire its own construction equipment.

On the other hand parts of the DINAAC program are currently subsidized and probably will continue to be so due to the low economic level of its clientele. It would appear appropriate therefore for DINAAC to secure from Endema, another government entity, a more favorable rate for the use of its services as a subsidy to its project construction.

G. Staffing

In view of the early stage of development of the shrimp research and development activities and the many unknowns with respect to the rate of its growth or effort has been made to analyze future staff requirements on training needs in that area. Any forecast could be meaningless at this stage.

With respect to the DINAAC central office, there is an immediate need to appoint a chief of the Transfer of

Technology Department and one of the Program and Evaluation Department. An additional staff member for the Department of Transfer of Technology would be desirable. It is believed that the Administration Department can absorb any increase in workload through better utilization of existing personnel.

Upon the completion of expansion of the DINAAC station it will have operations in two sites. This will require some expansion of labor personnel. Although the present chief of the station feels the expanded station can be directed without any increase in technical personnel there is some question as to whether this is desirable or feasible.

This situation should be reviewed at such time as the station is completed.

Other than Region 2 which appears adequately staffed for the immediate future, expansion of the Regional Staffs will be required in Region 4 and suchother regions as may be included in the program. The exact need of expansion cannot be determined at this time since the level and nature of the programs to be undertaken have not been determined as yet, although a minimum of two is recommended for any new region.

One staffing deficiency noticed in Regions 2 and 4 is absence of secretarial service to provide typing, receptionist, filing and record keeping services . The records required

to be maintained at Regional level on fish production, feeding etc. could be maintained by the secretary thus relieving an extension agent of this basically clerical function.

One problem facing the regional offices is that of properly servicing the areas of difficult access and which do not have adequate facilities for agents to remain in the area overnight. An effort was made in the past to resolve this problem by employing a resident of the area at what might be described as a para professional level to render services which otherwise would not be available. Unfortunately this effort, it is understood, was unsuccessful due it appears to personality problems related to the individual. Despite the past failure it is believed this concept should be given another trial. A careful orientation should be given to the person or persons so utilized so as to avoid some of the pitfalls encountered in the original use of such type personnel.

H. Training

In country training it is generally stated will be required for two separate groups, the operators or managers of individual pond projects and staff engaged in the fish swine production program particularly at field or regional level.

The exact needs for training of the former group in fish

production, maintenance of financial and other records, pig production, garden production etc. have not as yet been defined nor have actual training programs or training materials been designed. Before any training program is commerced a more detailed survey and analysis needs to be made of the level of knowledge requirements for these people and the nature of published materials which will be of utility and can be absorbed by them.

With respect to staff training, two types of training should be considered. Group sessions and individually tailored programs to meet the knowledge requirements of specific individuals.

As to the group sessions, two objectives should be sought. One to develop a closer relationship between central staff and regional personnel and the other to interchange experiences being encountered in daily operations as a means of providing on the job training. As visualized such group sessions would be held at least once every two months for 1 to 2 days at a time., such sessions would be based on a pre-planned agenda and include all regional personnel and key central staff personnel. The Director of DINAAC should to the extent possible preside over such sessions. Responsibility for the above training activities should be that of the

Department of Transfer of Technology. The current incumbert could be assigned these responsibilities.

I. Credit

At the present time the station at Divisa is making deliveries of fingerlings, plastic bags, feed from its supplies for some individual projects on a credit basis. As of the 8th of May a total of $957.82 cents covering 72 establishments was outstanding for an average of approximately $13 per establishment. These ranged from a low of 30 cents to a high of approximately $65. Thirty three were for sums less than $10. Collection of these past due amounts is the responsibility of the Regional Office. It is not clear as to what extent some of these accounts may be uncollectable. However it does present a question as to the extent to which the Regional Office should expend its time and efforts in an to attempt to collect these amounts, especially in view of their smallness and the negative results which could result from a too intensive collection effort. This matter should be reviewed by DINAAC and appropriate instructions issued to the Regions.

Mention has been made of the need for relatively small amounts of credit for the integrated fish-swine projects. Amounts too small to fit into banding or lending institutions. Mention has been made also of the possibility of handling these small loans through existing cooperatives. Time has

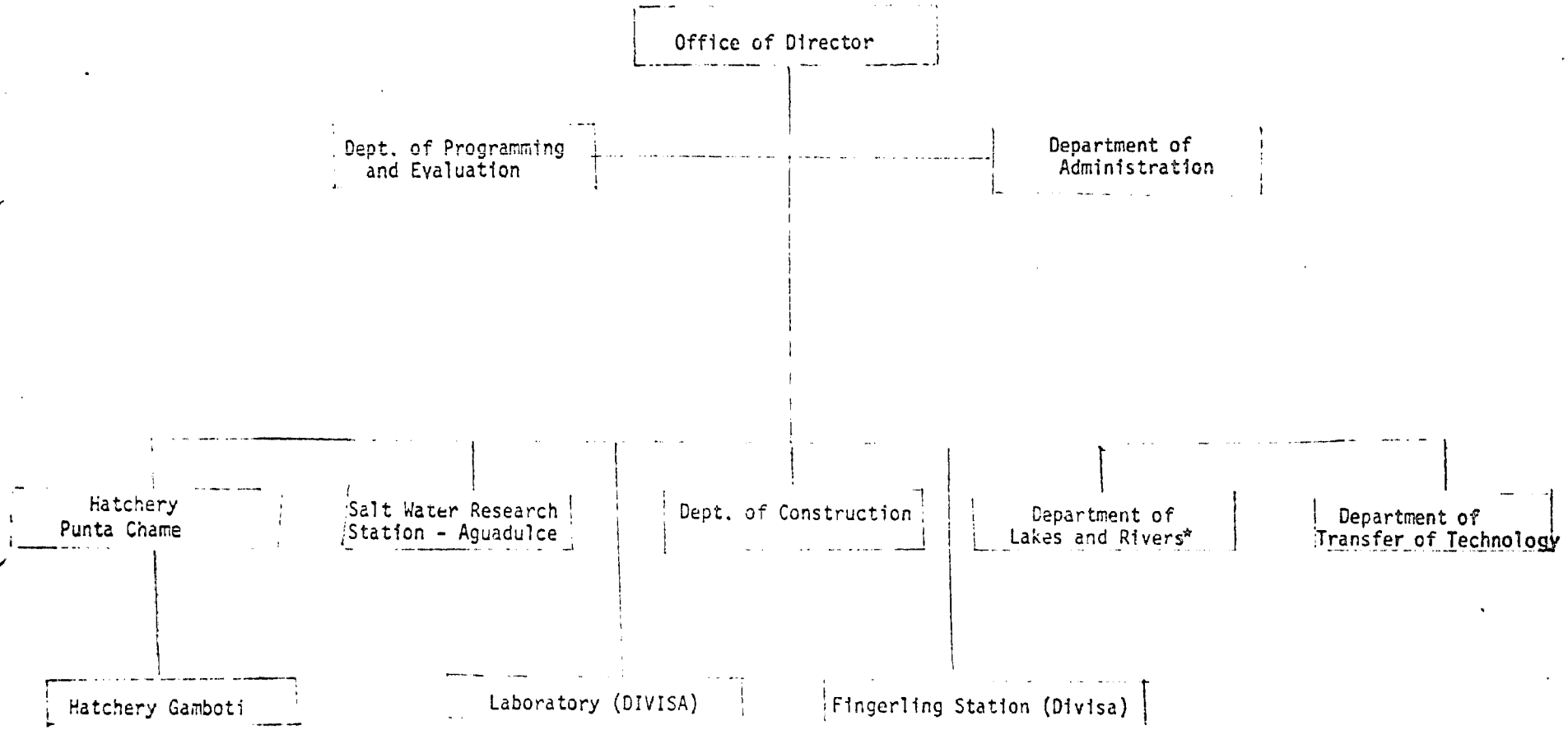
precluded any study of this possibility. However this possibility if further investigation ruled it to be feasible would be preferable to having DINAAC or the Regional Offices assume such responsibility.

However, assuming credit for a fish-swine production activity must be made available within the governmental structure the question arises as show best it could be administered. The answer then would be in line with the organizational concept that governs the relationship between DINAAC and the Regional Offices. That is to say the Department of Transfer of Technology would be responsible for developing the policies governing the administration of loans, the standards required for elegibility for such loans, the terms of such loans and such other related items. The Regional Offices would receive the individual loan applications, issue approval or disapproval of such applications, disburse monies in conjuction with the regional administrative and financial personnel and make collections. DINAAC would have a post-audit role to assure that the Regions have administered or are administering the funds properly.

The financial mechanism would be a rotating fund administered at Regional level with the Administrative Department of the Regional Office disbursing funds and maintaining the accounts on behalf of the regional aquaculture department.

The Regional Aquaculture Director Region 2 has indicated such a basic operation would be feasible.

National Directorate of Aquaculture - Appendix 1




* Located in RENARE at Paraiso as a cooperative program with that agency.

Appendix 2

# FUNCTIONAL STATEMENTS

## Office of Director

Establishes the policies to govern the national aquaculture program.

Administers the national aquaculture program including the issuance of technical and administrative standards and guides.

Maintains liaison with central Ministry offices and Regional Directors to develop their understanding and active participation in furthering the aquaculture programs.

Maintains liaison with International Agencies and private institutions to develop cooperative programs in aquaculture.

## Department of Administration

Directs the administrative affairs of the department including personnel, operating budget, general services such as procurement, transportation, space, per diems, accounting, secretarial services, and building maintenance.

Develops and coordinates the internal communication system of the Directorate including the issuance of appropriate administrative policies and instructions.

Makes studies of the administrative and program procedures of the Directorate and recommends improvements.

Makes field visits to provide assistance and review of administrative problems and practices.

Maintains liaison with Ministry central staff offices to expedite the centralized services provided by them to the Directorate.

Department of Programming and Evaluation

Coordinates the planning of aquaculture activities and projects.

Coordinates the preparation and execution of the investment budget including those involving inputs by international agencies.

Organizes and coordinates regular and special evaluations of aquaculture projects and activities.

Prepares regular and special reports and develops information required by the Director and outside agencies.

Maintains statistics on production of fingerlings, fish production, feeding inputs and other program statistics.

Maintains surveillance of program and project progress.

Coordinates the development of standards for the selection and implementation of individual projects.

Mades special economic and feasibility studies of proposed new projects.

Department of Technology Transfer

Prepares policy, program and technical guides and standards for the implementation of aquaculture programs.

Provides program and technical guidance and assistance to the aquaculture units in the Regional Offices.

Reviews the implementation of aquaculture programs, projects and activities by the Regional Offices and prepares recommendations for changes and improvements.

Conducts or coordinates the conduct of in-country training of private participants in the fish pond projects and staff of the Directorate and Regional Offices.

Prepares training materials for the above.

Participates in the technical evaluation of results being achieved in fish, swine and other production.

Prepares informational materials for pond operation, swine and garden production.

Department of Construction

Develops the guidelines and standards to be utilized in site selection and construction of individual ponds o varying sizes.

Provides technical advice and topographic assistance to the Regional Offices for the construction of individual ponds.

Inspects individual ponds during construction and upon completion to assure such construction is technically sound and has an adequate water supply and drainage system.

Provides similar services to the above for project related constructions such as pig raising facilities.

Plans and directs construction of facilities operated by the National Directorate.

Laboratory (Divisa)

Provides laboratory services on water quality, soils nutrition and parasites and diseases to the National Directorate and Regional Offices.

Department of Rivers and Lakes

Provides technical advice and assistance for aquaculture activities in rivers and lakes of the country.

NOTE: This department involves a cooperative program with RENARE and is located within the RENARE organization.

Divisa Fingerling Station

1. Produces fingerlings to be utilized in the seeding of individual pond projects.

2. Prepares fingerlings for shipment and dispenses feeds for individual projects.

3. Does practical research on the feeding, breeding and growth of fish.

4. Maintain and produce broad stock of different species.

Regional Offices
Aquaculture Department

Assist community groups in planning and developing fish, swine and crops production projects in a variety of combinations including site selection, construction of ponds and other production facilities, provision of feeds and fingerlings for the seeding of ponds.

Maintains periodic contact with community groups operating fish, swine and/or crops projects providing necessary technical advice and guidance.

Participates in the harvesting of fish and marketing of swine as necessary.

Distributes feeds, fingerlings, hogs etc to operators of individual projects.

Works with other Departments of the Regional Office to secure their assistance and cooperation in aquaculture projects.

Participates in the training of community leaders on the management of projects or identifies needs for such training.

Maintains statistics on fish and swine production and prepares monthly reports to the National Directorate of Aquaculture.

Salt Water Research Station "Ing. Enseñat" (Aguadulce)

Operates ponds raising shrimp from past larvae 5 day stage to 45 days and from 45 days to approximately 140 days. Performs research on shrimp growth in both the above stages.

Provides technical assistance to private organizations involved in shrimp operations.

Hatchery (Punta Chame)

Raises shrimp to post larvae 5 day stage for transfer to research station at Aguadulce

# APPENDIX 3

## STEPS SET FORTH FOR PURCHASES OPERATING BUDGET

| | |
|---|---|
| Directorate | makes request on form pc 1 |
| Dept. of Proveeduría | receives request pc 1<br>obtains bids (form pc 4) 3 commercial establishment<br>prepares cuthorization of purchase (pc 5) |
| Internal Audit | verifies bids<br>verifies purchase authorization Pc 5 |
| Administration Director | Gives approval on pc 5 purchase authorization |
| Acct. Dept. | Prepares check |
| Admin. Director | Sign check |
| Audit of Contraloría | audits Pc 1, 4, 5<br>signs check |
| Dept. of Accounting | Receives all documentation with signed check |
| Dept. of Proveeduria | Receives check and makes purchases<br>If doesnt make purchase returns check |
| Warehouse | Receives from Proveeduria or the merchant the merchandise with form pc 7 receipt of merchandise<br>List on material control pc 9<br>Sends to requesting Directorate form pc 8 order of delivery of materials |
| Directorate | Picks up purchase |

Appendix 4

## INVESTMENT BUDGET - PURCHASING PROCEDURE

| | |
|---|---|
| Directorate - | Prepares request on PC 1 |
| Dept. of Provedurfa - | Receives request PC 1<br>seeks bids 3 commercial establishment PC 4<br>Prepares Purchase Order PC 6 and signs it |
| Internal Audit - | Verifies bids PC 4<br>Verifies purchase order PC 6 (project, budget, code) |
| Sectorial Planning - | Approves Purchase Order PC 6 |
| Administrative Directorate - | Signs Purchase Order PC 6 |
| Contraloria Auditor - | Audits the documentation<br>Approves (bid PC 4, Purchase Order PC 6) |
| Dept. of Proveedurfa - | Makes purchases |
| Warehouse - | Receives merchandise Form PC 7<br>Registers in Material Control PC 9<br>Sends to Purchasing Directorate PC 10<br>Vendor submits accounts (purchase order, request for payment, bill of sale) |
| Dept. of Accounting -<br>Director Administration<br>Sectorial Planning - | Prepares checks<br>Approves preparation of checks<br>Signs checks |
| Auditor of Contraloría - | Verifies and signs check<br>Assures materials have been received and funds/ |
| Dept. of Accounting - | Sends payment copy to Sectorial Planning<br>Delivers check on Tuesdays and Thursdays |