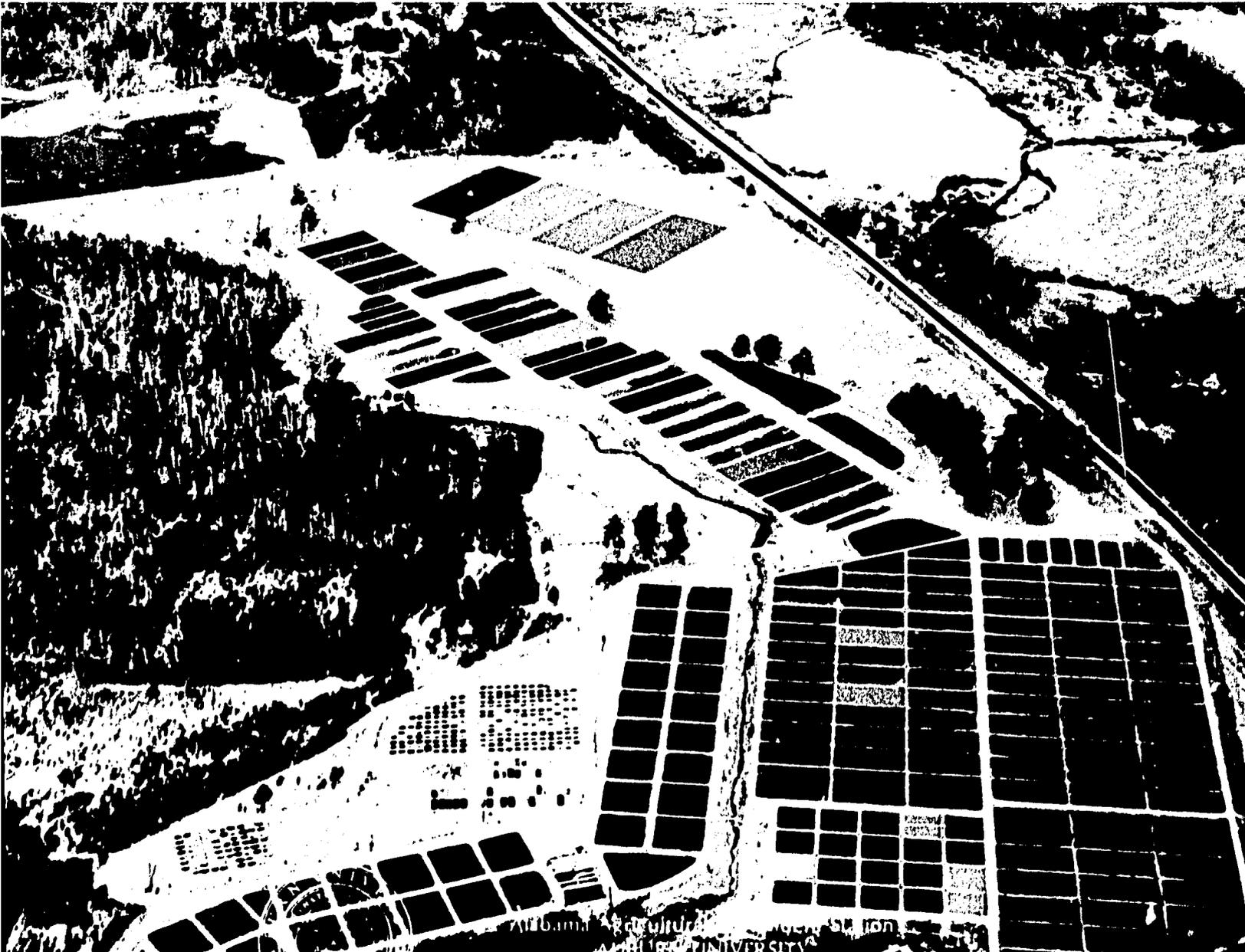


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FINAL EVALUATION

of the

**FRESHWATER FISHERIES DEVELOPMENT PROJECT
USAID No. 492-0322**

by

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I. EXECUTIVE SUMMARY

A. Project History and Purpose

The 5-year Freshwater Fisheries Development Project (FFDP, 492-0322) initiated in 1979, is the third AID-assisted aquaculture project in the Philippines. The project seeks to exploit the vast, but relatively undeveloped potential for freshwater aquaculture by establishing a Freshwater Fish Hatchery and Extension Training Center (referred to as the Center and FFH-ETC) in Central Luzon (Region III). The Hatchery will produce fish fingerlings for initial use by fish and rice-fish farmers. The project seeks to stimulate the establishment of 7,500 fish and rice-fish farms and private hatcheries capable of eventually producing twice as many fingerlings (40 million) as the center itself. The Government of the Philippines (GOP), through the implementing agency, the Bureau of Fisheries and Aquatic Resources (BFAR), is providing about P24 million (roughly \$3 million) for construction, maintenance, and operation of the FFH-ETC (ponds, buildings, employee housing, etc.) and for salaries of BFAR project workers. USAID is providing \$1.7 million for technical advisory services, hatchery and extension technical advisory services and commodities. A USAID contract with Texas A&M University (TAMU) provides for most of the services, including long and short-term training for BFAR project employees, and on-site technical assistance.

A mid-term evaluation of the project was made January 4-19, 1982. TAMU's technical assistance is scheduled to end January 31, 1984, and Project Assistance Completion Date (PACD) is February 1, 1984.

B. Evaluation Objectives and Methodology

The following scope of work is taken from PIO/T No. 492-0322-3-00155 as amended by cables Manila 20466, STATE 206597 and Manila 12321

- a. Review and become familiar with original project design/objectives, mid-project evaluation (January 1982), socio-economic and technical impact evaluations (1983) and others to assess project gains, outputs, and strategies.
- b. Visit project site and beneficiaries, observe, review, and interact with project personnel to assess project accomplishments and future plans. Integrate their analyses, conclusions, and recommendations into a holistic five-year management plan (both technical and non-technical) to commence after PACD, regarding the project's future operations.
- c. Make objective quantitative and qualitative assessment of project inputs and outputs. Measure the timeliness and effectiveness of outputs toward achieving project purpose and goals. Assess methods and procedures used in operating and managing the project and linkage with other complementary fishery programs. Make recommendations on the five-year action plan for GOP staff who shall operate the project after PACD.

- D. Relate lessons learned and provide recommendations concerning introduction of freshwater aquaculture into upland rainfed areas in relation to USAID's Rainfed Resources Development Project No. 492-0366).

Initially, the Evaluation Team was briefed by USAID/Manila and by BFAR of the Ministry of Natural Resources (MNR). Subsequently, the team interviewed Project personnel and various other persons and agencies involved with Philippine aquaculture. A 10-day field visit to the project site at Munoz, Nueva Ecija Province, entailed interviews and interaction with technical staff, cooperating fish farmers, and with the Region III BFAR Director and staff. Subsequently, a draft report was prepared and preliminary findings were then discussed with the FFH-ETC staff, at Munoz, the Director of BFAR and staff in Manila, and with the Chief of the USAID Office of Rural and Agricultural Development (ORAD), Manila. Following these discussions revisions were made the final report was prepared.

C. Conclusions and Recommendations

1. Introduction

The project as originally designed is very well conceived. Tilapia as a fish for culture and food is well accepted by farmers and consumers. Tilapia fetch a price which is as high or higher than milkfish. Cooperating farmers interviewed were enthusiastic about tilapia culture. They are making a profit growing tilapia and they take pride in their accomplishment. Although the project focuses on rice-fish, farmers seem to prefer monoculture of tilapia because it is more profitable and poses less problems than rice-fish culture. Some farmers are beginning to develop their own hatcheries along with variations of tilapia culture such as vegetable - fish, cage culture, and backyard ponds. Project purposes and outputs outlined in the logical framework should be achieved eventually, but not all will be achieved by the end of the project (February 1983). An 18-month delay on construction set back hatchery production. Moreover, the current drought has affected both hatchery production at the project site, and demand for fingerlings by farmers. All hatchery ponds are functional and the desired output of fingerlings is definitely achievable. The extension component of the project is on track. Extension workers are well trained and accepted by cooperators. In general, the projects' technical staff are motivated and like their work.

Administration and management of the project must continue to improve. Responsible administrators must see that logistic support for hatchery and extension staff is given, including adequate diesel fuel, transportation to cooperator's farms, completion of housing for technical staff, and general support for all operations.

Firm linkage between the project extension workers and those of Region III is progressing. It is vital that this linkage and cooperative bond be strengthened to assure continued success of increased fish

production and consumption. Following are specific comments on various components of the project.

2. Hatchery Component

a. Present status

The production facilities for fish seed are virtually complete, and the production of Tilapia nilotica fingerlings and brood stock have been under way since May of 1982. To date the system has yielded about 3.10 million seed during a 12 month production in 1982. This is below the projected maximum annual output of seedlings but the recent completion of unfinished facilities, distribution of smaller fingerlings, initiating the propagation of common carp, Cyprinus carpio, and decreasing the time between fingerling crops, should enable achievement of the projected target of 8-10 million seed per year.

b. Recommendations

It is recommended that the fish holding building be made operational immediately. The practice of keeping a spawning-rearing pond in production for more than 120 days should be replaced with a 90-120 day cycle for spawning-rearing ponds and 60 days for rearing ponds unless the size seed required dictates a longer growing period. Common carp should be spawned and reared to distributable size during months when T. nilotica spawning is suppressed by low water temperature. Tanks in the hatchery building should be used for tilapia fry production, and plans implemented for an incubation facility for tilapia and carp eggs. The pond dikes should be topped with gravel and completed and earthwork deficiencies of pond dikes and pond bottoms should be corrected as soon as practical.

While personnel manning the hatchery unit appear to be well trained and competent, there is a need to fill the position of unit head which is presently vacant. This key position must be filled without delay and steps should further be taken to train other technical staff to assure smooth operation of the hatchery component.

3. Extension Component

a. Fish Distribution

The Center distributed 2,558,193 tilapia fingerlings and breeders to 590 farmers/cooperators during the first 10 months of 1983. This is below the expected outputs in the project logframe. Improvement of fingerling production will increase output in the future.

The delivery system for fish has been successful and improved methods of handling and transportation have been implemented

to minimize costs. However, a centralized method of delivery is recommended instead of the present delivery on an individual-basis. The setting up of a network of fish holding facilities in the region with improve efficiency and minimize delivery costs.

The present price for fingerlings charged by BFAR needs to be increased. Prices should be competitive with prices charged by the private sector to encourage more private hatcheries.

b. Extension Outreach Techniques

The result-demonstration technique of the extension outreach applied by the Center appears to be extremely effective. To maximize the impact of such demonstrations, however, socio-economic aspects should be included in the methodology. The outreach techniques applied need to be evaluated .

The extension activities of the center and those of Region III should be unified to effect better results. Closer coordination between research workers of the FAC and extension workers of the Center is recommended. The organization of the BFAR-CLSU Coordinating Committee established is a step in the right direction.

Extension brochures and manuals need to be prepared by the FFH-ETC. The staff should utilize existing expertise for technical editing and publication at the BFAR Central Office, CLSU and the Philippine Council for Agriculture and Resources Research and Development (PCARRD).

c. Training

The Center has conducted a number of training activities for extension workers and farmers. It is recommended that an evaluation system be developed to assess the impact of the training programs. Regular training programs should be offered to facilitate resource allocation and scheduling. Training manuals need to be prepared. The Center should continue to tap the expertise of personnel and facilities of the CLSU-FAC in the conduct of training programs. In the future, the Center's training staff will require upgrading and professional advancement.

4. Project Administration and Management

a) Organization

The present organizational set-up and functional processes of the project needs are not quite operational due to the lack of visible leaders in key units such as the hatchery management unit and the administrative unit. The extension unit presently headed by the project manager, likewise needs general supervision and guidance in the conduct of its work in view of the other important responsibilities of the project manager. The move to assign a new hatchery management officer

by the project manager should be supported. The administrative officer should be required to spend more time at the center. With the expected decrease in construction activities, due to be completed in the near future, the project manager will be expected to devote more time in project management at the site. Strict implementation of the operations manual should be done.

b) Communication

Internal communication and coordination among staff and functional units should be enhanced. The present situation appears to enhance individual efforts rather than team efforts. Project staff meetings presided by the project manager should be held more regularly in order to provide a forum for the continuous exchange of information and ideas related to the work.

c) Advancement

Staff perception indicates slim opportunities for professional advancement and growth in terms of promotions and other forms of trainings particularly to those without masteral degrees. The plans of the project manager to secure additional supervisory positions for the project should be supported. Internal arrangements on working schedules could probably be made to allow interested staff to pursue masteral studies at the CLSU-College of Inland Fisheries (CIF). Allowing those interested and qualified to teach at the (CIF) on a part-time basis, would be desirable.

d) Administration

The tedious and long length of time in processing Request and Issuance Vouchers (RIV's) and Purchase Orders (PO's) for supplies and operational inputs has more often than not adversely affected project activities.

A more efficient administrative and processing system should be adopted to insure availability of supplies and operational inputs. Additional support staff may be given to the administrative unit. Personnel should, to the extent possible, be at the project site to attend to the needs of the project.

e) Efficiency

With the present economic realities faced by the country, the belt-tightening measures taken by the GOP will surely affect project targets and activities. A more systematic and efficient allocation of resources should be determined and established to maintain project momentum in attaining its objectives.

f) Logistics

Utilization of vehicles and other logistical support services

are not fully maximized. There is a need to maximize use of the project resources (vehicles, equipment, etc.) to fully achieve project objectives. The present assignments of vehicles and other resources need to be assessed to determine most efficient use.

g) Further Training

Key project personnel would require further training in leadership, management as well as other related technical skills. The key staff composes the core group of freshwater fisheries specialists and their roles in the future are to train others. Training programs should include leadership and management courses.

D. Future Considerations

1. Extension of Select Components of the Project

It is suggested that the project be extended as follows: Six months for a long-term advisor, and between one and three months for each of two short term advisors. Personnel could serve concurrently or consecutively. Also suggested is that provisions be made to allow for a future short term advisor on an as-need-be basis. Extension activities of the Center and Region III must be integrated as one in order to meet major project objectives. The present extension program in Region III was initiated July 1, 1983 by Director Frank Pili of BFAR and his staff. Good progress is already evident. For example, Center extension workers and extension workers from Region III initially used different methodology in working with cooperators. Now, they use the same basic approach such as a standard record sheet. Even so, Director Pili has expressed a keen interest in the need for further technical assistance. First, an evaluation system should be developed for agents and programs, and second continued short term assistance is required in developing extension methodology for extension workers. TAMU has on board two extension specialists who can assist with both needs. The long-term advisor with TAMU can assist in the overall coordination of the extension linkage between the Center and Region III. This advisor can also help push through select needs of the project, including installment of equipment to make the indoor hatchery and outdoor holding facility operational, and development of extension manuals for technical staff and farmers. The long-term advisor should have a good grasp of all aspects of the project.

The suggested extension of the project assumes that:

- a) the demand for fingerlings and extension continues to increase in Region III;
- b) the income from rice-fish and fish monoculture continues to be favorable for farmers;
- c) Region III continues to weld its extension methodology with that of the FFH-ETC;
- d) the Central Office of BFAR in Manila continues its strong support of the project.

At this juncture, it appears that these prerequisites will be met. Demand for both fingerlings and extension is high. Tilapia culture is a success and is expanding. Director Pili of Region III has already taken positive steps to meld extension methodology of Region III and the Center. The same data sheets are now used by all extension workers. Technical staff of the Center and extension workers of Region III are meeting to set strategies toward a common goal. At the Central Office, Director Gonzales is taking positive steps to augment the Center. He sees it as a "new inspiration" for BFAR and wishes to make it a national model for freshwater fisheries training and extension. The 1984 budget is targeted for 1.163 million pesos up from 1.145M for 1983. The projected budget for a 5-year period up to 1987 shows a steady commitment to the project. (See Annex C).

It is strongly believed that significant benefits could be derived from an extension of the project if the existing administration and management system are improved. A strong project management adequately supported by an efficient administrative machinery is deemed essential in implementing the pronouncements supportive of project objectives made by the BFAR leadership. The recommendations stated in the next section should therefore, merit serious consideration and a deeper sense of commitment from the project management.

2. Five Year Plan

a. Introduction

In general, all efforts should continue to achieve the existing goals of the project i.e. to increase freshwater fish production and consumption for rural poor. Much of the effort now underway should simply continue and increase. Hatchery production should grow to the target levels to meet fingerling demands.

Extension contacts with farmers, field days, and related activities should also increase. Certain aspects of the Center program should be modified over time; for example, ultimately the hatchery component should gradually phase out distribution of fingerlings to farmers as the private sector gradually takes over. Attention should there be shifted to brood stock improvement, testing of new fish species, and increased demonstrations and short courses. Following are suggestions for a 5-year plan, broken down into convenient categories. No attempt was made to show a detailed year-by-year plan. Rather, suggestions are made to give direction and purpose to the program.

b. Hatchery Component

For the hatchery component to serve as an effective model of a national center of fish seed production, present facilities need to be made fully operational and managed to achieve the

targeted outputs. Further expansion of ponds or addition of more buildings serves to dilute available resources of personnel and funding for operations and maintenance.

It is recommended that the 5-Year Plan of the hatchery component of the Project concentrate on bringing existing facilities to a state of optimum productivity by application of sound management procedures which meet current fish seed needs, maintain and improve existing facilities and equipment and realistically anticipate future trends in freshwater aquaculture.

Some of these trends may include the following:

- 1) Developing improve strains of brood stock.
- 2) Multiplying improved strains of broodstock developed elsewhere.
- 3) Evaluate more intensive methods of fish seed production.
- 4) Implement and later demonstrate the successful ones to extend the knowledge to other public and private hatcheries.

c. Extension Component

- 1) Place emphasis on and be engaged in fish broodstock development and production rather than in fish production. Given a certain time frame, the private sector should take over the present function of the Center as a hatchery facility. The Center should then maintain and supply high-quality fish broodstock to private and government hatcheries in Region III and other regions.
- 2) Work closely with the FAC and other research institutions in undertaking technology verification and adaptive research on freshwater aquaculture.
- 3) Produce and publish extension - type literature on freshwater aquaculture for extension workers and fishfarmers.
- 4) Serve as a source of technical expertise for government and private freshwater fish farmers in Region III and other regions.

d. Training

- 1) Serve as the national training center for BFAR extension workers and community leaders on freshwater aquaculture. The Center should conduct training of trainers.
- 2) Produce and publish training manuals on freshwater aquaculture for extension workers and fish farmers.
- 3) Support and complement the FAC in the conduct of international training programs on freshwater aquaculture.

e. Project Administration and Management

- 1) The existing project administration and management need to be improved in order to insure efficient and continuous operations of the Center in the future. Key project staff, particularly the heads of the functional units as well as the project manager, need further training to enhance their skills in managing people and resources as well as in decision-making. Attendance of key staff to short term (2-3 weeks) management courses appropriate to local conditions is highly recommended. Such courses offered at the University of the Philippines, Ateneo Graduate School of Business or the Executive Development Academy may be considered.
- 2) To insure continuity of project operations, key staff should be assigned at the project site on a full-time basis.
- 3) Internal communication and coordination among the project personnel need to be improved. A mechanism which will provide the staff with a forum for the exchange of ideas and an open discussion should be introduced.
- 4) It would be highly desirable to provide staff with opportunities for professional growth. This could be in terms of further training in related fields, masteral studies, as well as possibilities for some staff to teach at the CLSU-CIF.
- 5) The apparent attitudinal and behavioral patterns of most key staff regarding their respective roles should be reoriented more towards the overall role of the Center on a regional and national level.
- 6) The present flow of work, particularly involving administrative matters needs to be streamlined to insure availability of operational inputs for both hatchery and extension activities.
- 7) A more favorable working environment conducive to increased personnel productivity should be given attention to compensate for the present salary and wage rates. Project management and the BFAR leaderships could inject more challenging development activities for the staff to undertake.

f. Rainfed Resource Development

Rainfed resource development plans might well explore the feasibility of using low earthen dams 2-8 meters high across small valleys to impound rainfall runoff, storing it for use during the dry season. Small reservoirs of 500-10,000m² surface area can be constructed with the resources of a relatively small community. Water thus stored is available for domestic needs, livestock, vegetable plot irrigation and growing crops of fish. A secondary benefit might be reforestation of areas in the vicinity of the reservoir.

Prerequisites for construction of water storage reservoirs include a soil suitable for formation of the pond basin, topography permitting building the dam across a narrow valley, enough rainfall on the surrounding watershed to fill the reservoir and sufficient earth moving capability in the community to build the dam.

Technology for management of small impoundments for multipurpose use is well developed and readily available in the Philippines and elsewhere. Demonstrations of several combinations such as poultry-fish-vegetables fruits, rice-fish vegetables, or pig-fish, can be seen in Central Luzon as an outgrowth of research by CLSU-FAC. Fish stocks are available through BFAR or can be provided by the private sector being guided by BFAR extension programs. Training in methodology of lowland pond management can be extrapolated with suitable modifications to coastal and rainfed areas. Some research in the area of application likely will be needed to effectively make this extrapolation.

A survey of areas included in the USAID Rainfed Resources Development Project to determine whether soil, topography and water supplies are suitable will permit consideration to be given to including aquaculture in the project. Given the availability of these basic requirements, it can then be determined whether a small water reservoir will serve as a means of achieving some of the goals of the Rainfed Resources Development Project.

II. BACKGROUND

A. Fish Production in the Philippines and Its Importance to Nutrition^{a/}

Fish is a very important component of the Philippine diet. It is the principal source of animal protein and ranks second only to rice as a source of protein in general. While fish production has increased in recent years, it is still not sufficient to meet the needs of the nation's 50 million people. Total fish production in the country was 1.67 million^{b/} metric tons (mt) in 1980, and increase of about 25% over the figure for 1975. For comparison, population growth for this 5-year period amounted to about 14%.

^{a/}This section is based on "The Philippine Inland Fisheries Project and Aquaculture Production Project - Completion Report" by Johnie H. Crance and Daniel F. Leary, International Center of Aquaculture Research and Development Series No. 24, Auburn University, Auburn, Alabama, 1979 and the report titled "Development of Aquaculture in the Philippines" by H. R. Schmittou et al. draft copy dated August, 1983.

^{b/}Fish Production data in this section are taken from BFAR, "1980 Fisheries Statistics of the Philippines", Vol. 30, Manila, 1981.

Though total fish production is keeping pace with population growth, the situation is not as optimistic as it looks. While average protein intake for the country as a whole is slightly above minimum requirements, intake for the country as a whole is slightly above minimum requirements, intake for farm workers is 9% below minimum requirement^{c/}. Fish exports have more than doubled since 1975 while imports have declined slightly. Though increased exports are good for balance of payments, they seriously cut into domestic fish consumption. Almost all increases in fish production since 1976 have been absorbed by exports, thus fish available for domestic consumption has remained essentially stable while population has continued to grow. These trends suggest that it will be very difficult for the fishing industry to meet future domestic demand for fish which is projected to reach 4 million tons by the year 2000. Also, many fishery scientists feel that the catch from seas surrounding the Philippines is approaching maximum sustainable yield. Furthermore, the costs associated with increasing efforts to catch more fish from the sea are becoming prohibitive due to rising costs of energy, fishing vessels, and gear. Thus, it appears that aquaculture will be called upon to meet an increasing share of the domestic demand for fish.

Aquaculture has been practiced in the Philippines for centuries. Nevertheless, production from this fisheries subsector is far short of its potential. During each of the last five-years, only about 8% of the nation's total fish production has come from aquaculture activities and over 90% of the fish produced by aquaculture is milkfish grown in brackishwater ponds.

The potential for development of freshwater industry in the Philippines, is great. Over 1.4 million hectares of irrigated rice paddies have potential for rice-fish culture, and there are more than 126,000 hectares of swampland some of which could be developed into freshwater fish ponds.

In 1970, the Government of the Philippines (GOP) implemented a broad program aimed at achieving improved nutrition for Filipinos. Increased production of fish was selected to receive special emphasis as a principal source of protein. A significant part of the development program was aimed at aquaculture.

B. Previous USAID Aquaculture Projects in the Philippines^{d/}

USAID has assisted the GOP with three closely related aquaculture projects. The rationale for these projects is based on the recognized potentials for increased production, the need for additional animal

^{c/}Food and Nutrition Research Institute, "First Nationwide Nutrition Survey Philippines, 1978 (Summary Report)", Manila 1979, pp. 13-15.

^{d/}Based on Crance and Leary, Ibid.

protein to supplement the Philippine diet, and the commitment of the GOP to improved aquaculture. The Inland Fisheries Project (IFP) was implemented from 1971 to 1974 and provides USAID assistance in the of approximately \$560,000. The Aquaculture Production Project (APP), was a follow-on to the IFP. It lasted from 1974 to 1979 and provided \$840,000 in USAID assistance. Both projects sought to improve the nutrition of Filipinos by improving aquaculture production, three aquaculture research, manpower training, and extension. The IFP concentrated on the establishment of two research training centers, the Freshwater Aquaculture Center (FAC) in Central Luzon, and the Brackishwater Aquaculture Center (BAC) located on Panay Island. Key staff members from each Center were sent to Auburn and other U.S. Universities for graduate training.

The APP focused on the continued physical development of the FAC and BAC, centers, the intensification and expansion of research efforts, and the establishment of two training programs, one leading to an academic degree, the other to a practical degree in aquaculture. The project also sought to institute an effective extension program within BFAR and to link this element with the research centers.

When the projects ended in March 1979, they could be credited with the following accomplishments:

- (1) Two aquacultural research centers, the first in the Philippines, had been established and were staffed by competent researchers; seven had received Ph.D. degrees and 10 M.S. degrees.
- (2) Both centers had instituted academic programs leading to degrees in aquaculture. The centers also offered short courses to extension agents and fish farmers.
- (3) A fisheries extension division, which focused on aquaculture, was formally established within BFAR.

C. Fisheries Sector Study

USAID Manila funded an in-depth fisheries sector study during the summer of 1977^{e/}. The main purpose of the study was to identify feasible courses of action for possible future AID involvement in the Philippine fisheries development program. This was accomplished by analyzing closely the fisheries sector and fisheries activities of the GOP and donors.

The study provided background information on the fisheries sector. The maximum sustained yield from marine resources was estimated at 1.85 million metric tons, less than half of the projected demand by the year 2000. The assessment team indicated that potential for expansion of aquaculture using existing technologies was significant. Three key findings were emphasized:

^{e/}"The Philippines: Fisheries Sector Study" James W. Avault, Jr., Jack Marr, Philip Roedel, Ziad Shehadeh, USAID/Manila, 1977, mimeo.

- (1) The main interest of the GOP is the problem of the municipal fishermen (i.e. the traditional or artisanal fishermen who account for roughly 63% of the fish production and are among the poorest elements of the Philippine society).
- (2) All spheres of fisheries, but most particularly those relating to implementation of the GOP fishery program, are greatly hindered (and sometimes completely prevented) by the shortage of trained personnel at all levels from technician to the doctoral level. This shortage is common in government with certain technical areas in the private sector.
- (3) There is an increasing proliferation of agencies and institutions engaged in fishery-related activities.

The team recommended that USAID consider assistance to the GOP in the following areas, listed in descending order of impact:

- (1) University of the Philippines College of Fisheries (UPCF) faculty upgrading and curriculum development in the context of resource development and management.
- (2) Study (leading to project design) how to effectively include coastal fishing villages in the rural development process.
- (3) Increase in income/food supply of rural poor by (1) establishing mollusk and seaweed culture in selected villages and (b) establishing a freshwater fish hatchery-nursery near the Central Luzon State University (CLSU-FAC), to produce seed for rice-fish farming and for watershed development projects.

In order to facilitate these activities, the team also recommended:

- (4) That USAID/Philippines add to its staff a well-qualified fishery generalist to serve as a Fishery Project Officer.

In accordance with recommendation 3, USAID assistance was provided for the FFDP. Also, efforts are underway to develop a project for assisting coastal village fishermen and USAID engaged the services of a well-qualified fishery generalist, Johnie H. Crance, to serve as a Fishery Project Officer until February, 1982.

D. Development of Aquaculture in the Philippines (Schmittou, et.al., 1982

The study sponsored by Auburn University through its International Center for Aquaculture and USAID/Washington, traced the development of aquaculture in the Philippines. Among specific objectives of the study were:

- 1) To determine the impact of aquacultural development, in general, on consumers, producers, GRP service institutions, the environment, and overall socio-economic development of the country;
- 2) To measure contributions of donor-assisted aquacultural project to development goals;
- 3) To identify existing as well as potential constraints and opportunities for future long-range aquaculture development, and

to recommend ways and means constraints may be minimized and opportunities maximized.

Among the findings pertinent to freshwater fisheries development are the following:

- 1) Nile tilapia cage culture, particularly in Laguna de Bay and some other lakes, is rapidly expanding. The technology applied and benefits derived from cage culture are reportedly the same as for pen culture.
- 2) Tilapia is becoming more popular with both producers and consumers. The price of tilapia was noted to be generally equal to or higher than milkfish in some parts of the country.
- 3) Culture in freshwater ponds could provide the greatest potential for increase in aquacultural production per unit area over the next several years.
- 4) The integrated agriculture - aquaculture production systems were noted to have tremendous potential, especially for small-scale, home-use, and limited commercial farm operations.
- 5) The study recommended the possibility of culturing other fish species aside from tilapia such as the grass carp, catfish, and macrobrachium shrimp whose potential are likely to remain low given competition to raise other species of known value and successful culture.
- 6) The study also noted the present state of extension service in fisheries, particularly the constraints to effective extension service and the overlapping and lack of coordination among some agencies and institutions. However, it also noted the positive impact of extension, particularly regarding increased activities in seaweed culture, tilapia production, pen and cage culture, and rice-fish combinations.

From the above, it could be concluded that the freshwater fisheries development in the country is gaining momentum. Proper recognition of the tremendous potential for increased production is noted and as a means to increase the socio-economic status of small-farmers. The Center could be seen as a catalyst in promoting freshwater fisheries development through its fingerling production activities and extension and training programs. This would justify the continuous government support to the project.

E. Research Studies

1. **Pesticide Residue Analysis and Monitoring Survey for Fish Cultured in Central Luzon**

The mid-term evaluation report, January 4-19, 1982, suggested that a pesticide use and monitoring program be initiated. The FFDP Project Paper also calls for an evaluation of the effects of pesticide on rice fish culture. BFAR arranged for CLSU-FAC to undertake such a study beginning on September 1973, using the latter's facilities. USAID, TAMU, and BFAR drew up a scope of work for CLSU-FAC to implement. CLSU-FAC and BFAR have jointly finalized procedures and scope of work.

Present status of the research is as follows:

Chemicals and other materials such as pesticide standards and the column packing materials for the gas chromatograph were not readily available and had to be ordered from abroad. So that the research was not unduly delayed, the cooperation and help from other pesticide laboratories was sought. Major pesticides used by farmers such as Furadan, Azodrin, Gusathion, and Benlate have been identified. Suitable procedures for the analysis of these pesticides are now being developed and standardized. At present, standardization procedures are in progress for procedures for furadan and gusathion in water and tilapia flesh.

One batch of samples (tilapia and water) has been collected from four farmer cooperators who use Furadan. The water samples have been extracted and are ready for injection into the gas chromatograph; tilapia samples were stored in a freezer. An on-site visit to the laboratory by the Evaluation Team November 11, 1983, revealed that work was in progress.

This research is extremely important and every effort should be taken to see that it is carried out. Should problems be found with pesticide residues, it would have a major adverse effect on rice-fish culture.

2. Economics of Hatchery Production

A study conducted by Broussard and Reyes (1983)^{f/} showed a return on investment (ROI) of 0.9% for production and dispersal of fingerlings in the Center sold at P0.09 each. It was conjectured that if the selling price was increased to P0.27/^{g/}fingerling, the ROI would be equal to the cost of capital (18.68%).

3. Socio-economic Study of FFH-ETC Cooperators

In a socio-economic study of the Center's cooperators in Central Luzon, Miralao et al. (1983)^{g/} found that the extension services of the Center were adequate. The major constraint of the cooperators was the insufficient water supply. The study team also noted that farmers had a general lack of basic knowledge on freshwater fish culture.

^{f/}Broussard, M. C. and C. Reyes, 1983. Economic analysis of a large-scale hatchery for the production of Tilapia nilotica fingerlings in Central Luzon, Philippines. Paper presented at the PCARRD-ICLARM Workshop on the Economics of the Philippine Tilapia Industry, Los Banos, Laguna.

^{g/}Miralao, V. A. et al. 1983. The Freshwater Fisheries Development Project in Central Luzon: Performance and Prospects. Draft Copy.

The majority of the Center's current cooperators grow freshwater fish in ponds rather than in ricefarms.

Cooperators consumed more fish (over 2kg/week) than non-cooperators (less than 1 kg/week).

Small hatchery operators generate a monthly net income of P2,795 while medium - sized hatcheries obtain a higher net income of P4,944 per month. For fishpond operators, the monthly net incomes were P673/month for small operators and P4,944/month for medium-sized operators.

The study team recommended improvement of the record keeping system of extension agents on their cooperators. A market tie-up between hatchery operators and fish growers in the region was also recommended to ensure market outlets for the large hatchery operators.

F. Freshwater Fisheries Development Project (FFDP)

(1) Project Identification

The FFDP (492-0322) is an outgrowth of GOP commitment to assist freshwater aquaculture, two previous USAID-assisted aquaculture projects and the 1977 Fisheries Sector Study. BFAR, the key GOP agency involved in development of the project, developed original plans for a freshwater fish hatchery and extension training center (FFH-ETC) in 1976-77. The two previous USAID-assisted projects, IFP and APP established a research capability and also pointed out the need for an outreach program. This need was articulated more fully by the Fisheries Sector Study (1977) which explicitly recommended establishment of a freshwater fish hatchery/nursery near the FAC at CLSU.

(2) Project Agreement

Project Agreement, signed March 30, 1979, called for a 5-year project to establish a Freshwater Fish Hatchery Extension Training Center in Central Luzon. Specifically, the project aimed to: (1) increase the supply of freshwater fingerlings (tilapia and carp); (2) distribute fish fingerlings to rice-farmers and to small-scale fishpond operators; (3) improve the flow of aquaculture information to farmers; and (4) assist farmers to produce fish and entrepreneurs to grow fish fingerlings.

Under the agreement, the GOP was to provide the equivalent of \$1,268,000 including costs borne on an "in kind" basis. The GOP contribution, which included P8,855,000 of PL 480 Title I funds, covered the costs of capital construction, operations and maintenance, as well as salaries for BFAR employees. The AIC contribution of \$1,700,000 covered the costs of project

commodities as well as technical support, advisory services and training most of which were provided by Texas A&M University (TAMU) through a USAID contract. TAMU was to provide short-and long-term consultants, out-of-country training for BFAR personnel, assistance in improving freshwater extension service, and procurement of selected commodities.

(3) Project Site Selection

The site for constructing the Center was selected adjacent to FAC on the campus of CLSU in Munoz, Nueva Ecija Province. This site was selected because of its proximity to FAC which could provide research capabilities and linkages and could complement the hatchery and extension training activities. In addition, the soil characteristics and water availability at the site were well suited for the project activities. CLSU provided the site to BFAR on a long-term lease for only a very nominal charge.

(4) Construction of Hatchery

The Center was originally conceived as a modest facility costing about P5 million. It consisted of about 15 hectares of hatchery ponds, a hatchery or wet building, office building, and a maintenance building. This plan provided the basis for the 1979 Project Agreement. Subsequently, plans for the facilities were modified by BFAR to increase the size of the facilities and to add new ones (staff and employee housing units, outdoor hatchery tanks, etc.). Due to the increases in facilities and inflation, cost estimates for the Center escalated to P17,618 million. The GOP National Economic and Development Authority (NEDA) later arranged for an increase of P3.855 million in PL 480 funds bringing the total funds available to BFAR for construction of the Center to P8.855 million. No more PL 480 funds were available for the project so NEDA and BFAR decided that the additional P8.763 million required for the expanded facilities would be requested by BFAR from the GOP Bureau of Budget.

During the summer of 1979, NEDA and BFAR decided (with USAID's concurrence) that BFAR would proceed to construct components of the Center in two separate phases. Phase I was to cost P8.555 million and consisted of the basic infrastructure necessary to produce fish fingerlings, conduct extension training and expand freshwater fish production in Central Luzon, i.e. hatchery pond system, water and electrical system and hatchery tanks, staff and employee housing units, a maintenance building, an administrative building, fencing and road improvement.

The GOP Ministry of Public Works (MPW) developed work plans and cost estimates for various components of the Center and proceeded to develop contracts for construction of buildings under Phase I. BFAR was granted permission to do site preparation work and to construct the hatchery ponds. Unfortunately, due to problems

encountered by BFAR in getting the P8.555 million released and delays encountered by MPW in getting the contracts finalized, construction on Phase I did not begin until November, 1979. The MPW began construction but performed poorly causing additional delays. In April, 1981 action by the Office of the President removed MPW from the project and authorized BFAR to complete the construction.

The Ministry of the Budget (MOB) approved the appropriation of an additional P8.763 million to BFAR in early 1980 for construction of Phase II. However, due to delays encountered in completing Phase I and for special action by the Office of the President removing MPW from the project, Phase II construction did not start until August, 1981. Construction of all facilities is now virtually completed.

(5) Technical Assistance

Despite delays with construction of Phase I, BFAR, USAID and TAMU mutually agreed that the technical assistance activities should be initiated. The TAMU long-term Hatchery Management Advisor (HMA) began his 2-year assignment in June, 1980. A Project Paper Amendment extended this an additional year.

The TAMU long-term Extension Advisor (EA), began a 2-year assignment in June, 1981, a year later than originally planned. The EA assisted BFAR with development plans for a viable extension program. Due to delays it became obvious that two years would not be adequate for the task. Additional time and EA services were needed to develop and implement the extension program. The project amendment provided an additional 6 months of long-term EA services.

In addition to providing two long-term advisors, TAMU is also supplying short-term advisors and technical training for BFAR staff. The project allows for a total of 16 person-months of short-term advisors covering a wide variety of technical skills. Eight BFAR technical employees received training in the U.S. during May-December, 1980 and are now part of the project staff. Four additional BFAR employees completed masteral level training at TAMU in August, 1982.

(6) Hatchery and Extension Activities

Fish production and extension activities were initiated in the summer of 1981. Rearing of tilapia and carp broodfish started in August, 1981. A total of 150,000 tilapia fingerlings of 15g size were available for farmers by February 1982. A 2-day training, coordination, and planning session was initiated in September for BFAR Region III District Fisheries officers. A total of 41 freshwater extension agents attended a one-week project orientation session. More than 160 fishpond and rice-fish

operators were contracted by the end of 1981. Hatchery and extension activities are discussed in detail elsewhere in this report.

III. PROJECT ACCOMPLISHMENTS, PROGRESS (LOGICAL FRAMEWORK)

Every AID project has a logical framework (logframe) matrix which describes the project design by explicitly stating project goals, purposes, outputs and inputs as well as verifiable indicators of these. The logframe also states the assumptions which are made in moving from inputs through outputs and purposes to ultimate project goals. This section presents and assesses the logframe for the Freshwater Fisheries Development Project. The mid-term assessment is presented as well as the final assessment. Although this report is the final evaluation (November 1-21, 1983) the project will not end until (February 1, 1984).

A.1. Logframe Goal

To improve nutrition and income of small rice farmers and fish farmers.

A.2. Logframe Measurement of Goal Achievement

- a) Consumption of locally produced freshwater fish in Central Luzon should have increased by 3,250/tons/year by end of 1983; increasing per capita consumption of fish for Central Luzon residents by 0.75 kg. Per capita consumption of fish should have increased by 14 kg. for 4,500 rural families producing rice-fish by 1983.
- b) Net income (based on value of fish consumed at home and sold) of 4,500 rice-farmers that begin the production of rice-fish shall have increased an average of \$22/ha/year by end of 1983.
- c) Net income (based on value of fish consumed at home and sold) of 3,000 fish farmers who begin the production of fish utilizing intensive aquaculture systems should average at least \$350/ha/year by end of 1983.

A.3. Assessment - Mid-term

As of January, 1982, it is still too early and data are not available to assess goal achievement.

- a) Due to project delays and lack of adequate supply of fingerlings in Central Luzon, it appears that goal A.2.a. above will not be achieved by the end of 1983, perhaps by the end of 1985.
- b) Data collected by the NFAC staff suggest that (nationwide) on a per hectare basis net income from rice-fish is about P2,552 compared to P1,735 for rice alone.^{h/} The difference amounts

^{h/} National Food and Agricultural Council (NFAC), "Rice-Fish Culture, Part-One - Production of Tilapia Fingerlings in Net Enclosures and Rice Paddies, Part Two-Primer on Paddy Culture of Fish", 1981, p.16.

to about \$100/ha/yr. If these figures are accurate, then rice farmers switching to rice-fish should easily be able to increase net incomes by the \$22/ha/year specified in the goal statement A.2.b. However, it is doubtful that 4,500 rice-fish farms will be in operation in Region III by the end of 1983; only 55 rice-fish farmers were operating in Region III as of October, 1981. This goal might possibly be achieved by the end of 1985.

- c) If current high prices for tilapia continue, it seems likely that fish farmers can achieve a net income of \$350/ha/year (A.2.c). It is more questionable that 3,000 fish farmers will be operating in Region III by the end of 1983, perhaps by the end of 1985.
- d) The three "Assumptions for Achieving Goal Targets" from the logframe appear realistic:
 1. Rice farmers and producers of fish will have the available freshwater aquaculture technology and will be motivated to grow more fish to improve their family's nutrition and to increase their family's income. (The first part, i.e. available technology, is not really an assumption, but a primary project purpose.)
 2. Filipinos continue their habits of being fish-eating people, accepting freshwater fish when available at favorable prices, (sic).
 3. The population in Central Luzon will not increase to more than five million by the end of 1982 from a total of 4.3 million in 1977.

A.4. Assessment - Final

- a) Data are lacking to determine by how much fish consumption was increased in Central Luzon by the end of 1983. One can only extrapolate from scanty data and make certain assumptions. According to a Region III report (November 3, 1983) a total of 1,252,099 tilapia and 21,508 common carp were dispersed in communal waters, private fishponds, fish cages, and rice-fish the first nine months in 1983. If we assume dispersal for the remaining three months of the year is comparable to the first 9 months then 1,669,465 tilapia and 28,677 carp will be dispersed. The Center dispersed (based on extrapolation) approximately 3,350,000 tilapia fingerlings during 1983 (Progress Report January-October, 1983 FFH-ETC). Combined, the total number of tilapia dispersed in 1983 was 5,019,465. Now if we assume 80% survival of all fingerlings and that fish when harvested averaged 50 grams each, then a total of 251 metric tons of tilapia would have been produced in Region III during 1983. Production from carp would increase this figure as would unknown production originating from private hatcheries. Director Pili (November 10, 1983 oral communication) estimates that the project area has a potential 11,000 ha of freshwater ponds. If each hectare is stocked at a rate of 20,000 (rice-fish would have lower a

stocking rate) and two crops are produced a year, then a total of 440 million fingerlings are required each year. Again, if survival is 80%, this translates into a potential of 17,600 metric tons produced per year in Region III.

To summarize fish consumption in the project area, it appears that the project goal of 3,250 tons/year is a realistic figure, but it will not be achieved by the end of 1983; it should be achieved in the future. Demand for fingerlings far exceeds supply. Major limiting factors for fish distribution in 1983 were: lack of fingerlings, lack of transportation to disperse fingerlings and the drought.

The project goal calls for an increase in per capita consumption of fish in Central Luzon by 0.75 kg. The latest available figure (1980) shows 4.8 million people living in Central Luzon (Region III Accomplishment Report, November 3, 1983). If we assume that 4.8 million had an additional 251 metric tons of fish to eat in 1983 then the per capita consumption in 1983 would have increased by 0.05 kg. over that of 1982. This figure takes into account only the increase for 1983 over 1982. The per capita consumption is probably higher than 0.05 kg due to fish from ponds started and stocked between the time the project started (1979) and ended (1983-84). Nevertheless, there seems to be a trend that fish consumption is increasing, but this could be offset somewhat by the high population growth rate of 2.64%.

A major goal was to increase per capita consumption by 14 kg for 4,500 rural families producing rice-fish by 1983. This goal is difficult to assess since of the Center distributed fingerlings to a total of 590 cooperators and private fish farms from January - October, 1983. If we extrapolate from this, then a total of 787 farms received fish for 1983. Region III in 1983 distributed (extrapolated) fish to 123 ha of rice-fish. If we assume that the average size farm was 500m² then a total of 2,460 families were served. This totals (Region III and FFH-ETC combined) to 3,247 families who were provided fish in 1983. Now, further assume a family of six persons, averaged size of water in fish production was 0.05 ha, and that production from rice-fish average production of 150 kg/ha or 7.5 kg per 0.05 ha. If two crops per year are produced, this is 15 kg. of fish for the family of six. If we assume all fish are eaten, then per capita consumption amounts to 2.5 kg. The project goal of 14 kg. does not appear to be realistic unless the hectareage in production is increased and/or farmers switch from rice-fish to fish monoculture. Based on interviews by the Evaluation Team, farmers have more fish in their diet and also some to sell. All interviewed were very pleased with the improvements fish have made in their standard of living.

- b) Net income of rice-fish farmers has definitely increased to Most farmers interviewed have plans to expand fish

production. They are doing this mainly by reducing area devoted to other crops. Based on a 1981 report by NFAC, farmers should easily net \$22/ha/year, which is stated as a logframe goal.

- c) The logframe goal of netting \$350/ha in intensive aquaculture systems is realistic. Two examples from FFH-ETC files for backyard fishponds follows:

Result of a backyard fishpond extension demonstration project.

Cooperator : Macario Salvador
Location : Talavera, Nueva Ecija
Pond Area : 0.013 ha
Treatment : Stocking rate : 20 000 Tilapia fingerlings/ha.
Fertilization rate : 3,000 kg/ha/mo Chicken manure
: 100 kg/ha/mo Inorganic Fertilizer (16-20-0)
Date Stocked : November 24, 1982
Date Harvested : March 3-31, 1983

GROSS INCOME P 502.00

| | | |
|-------------------------------|------------|---------------|
| Value of fish sold | (27.5 kgs) | P 330.00 |
| Value of fingerlings produced | (2,150) | <u>172.00</u> |

EXPENDITURES

| | | |
|----------------------|-----------|----------------|
| Fingerlings | (260) | P 73.80 |
| Chicken manure | (111 kg) | P <u>20.80</u> |
| Inorganic Fertilizer | (16.5 kg) | <u>15.00</u> |
| | | <u>38.00</u> |

NET INCOME P 428.20

Result of a backyard fishpond extension demonstration project.

Cooperator : Victor Agagni
Location : Sto. Nino II, San Jose City
Pond Area : 0.1039 ha
Treatment : Stocking rate : 30,000 Tilapia fingerlings/ha
Fertilization rate : 3,000 kg/ha/mo Chicken manure
100 kgs/ha/mo Inorganic fer-
tillizer (16-20-0)
Date stocked : Dec. 27, 1982
Date harvested : March 18 - May 18, 1983

| | | | |
|--|--|---|-----------------|
| <u>GROSS INCOME</u> | | P | <u>4,550.00</u> |
| Value of fish sold (178 kg) | | P | <u>2,670.00</u> |
| Value of fingerlings sold (1,750) | | | <u>140.00</u> |
| Value of fingerlings given free (21,750) | | | <u>1,740.00</u> |
| <u>EXPENDITURES</u> | | P | <u>417.36</u> |
| Fingerlings (3,117) | | P | <u>249.36</u> |
| Chicken manure (185 kg) | | | <u>50.00</u> |
| Inorganic Fertilizer (50 kg) | | | <u>118.00</u> |
| <u>NET INCOME</u> | | P | <u>4,132.64</u> |

B-1 Logframe Goal

To increase freshwater aquaculture production and consumption in Central Luzon.

B-2 Logframe - Measurement of Goal Achievement

- a) 1,350 metric tons (mt) of fish produced per year in paddies with rice by the end of 1983.
- b) 1,837 metric tons of fish produced per year in intensive fish culture systems by the end of 1983.

B-3 Assessment - Mid-Term

At the time of the evaluation, it was still too early and data were not available to assess achievement of project purpose.

- a) Progress to date makes achieving the target of 1,350 mt from rice fish unlikely by 1983. A date of 1985 is more realistic.
- b) Though it is unlikely that intensive freshwater fish farmers in Region III will produce 1,837 mt by 1983 this may be possible by the end of 1985. At an average pond area of 1.5 hectares, the target 1,837 mt implies that 816 fish farmers will be in production.
- c) Two of the logframe assumptions for achieving project purpose are quite realistic, i.e.:
 - 1) the price and market conditions of freshwater fish remain favorable; and
 - 2) prolonged adverse weather, destruction to rice-fish or fish pond production will not occur.

The two other assumptions relate to rice-fish farming, i e.:

- 3) the GOP will formulate policies which promote and are conducive to integrated agro-fisheries production; and
- 4) new rice pests will not emerge that will require the application of amounts or types of pesticides that will not permit fish to be grown in paddies with rice.

The third assumption seems realistic since the GOP is supportive of rice-fish farming. The pesticide issue is still alive and potentially could jeopardize efforts to promote rice-fish production.

B.4 Assesment - Final

According to a Region III (11-3-83) report, 123 ha of rice-fish were development in 1983.

- a) Assume that roughly half of the 3.3. million fingerlings distributed by FFH-ETC went into rice fish, that survival was 80%, and fish were raised to 50. Combining Region III and Center data, then approximately 678 metric tons of fish were produced in ponds stocked for rice-fish in 1983. This does not take into account production from ponds stocked prior to 1983 nor ponds stocked from private hatcheries for which there are virtually no data. The logframe goal of 1,350 mt produced in rice-fish is realistic by 1985. It should be noted, however, that many rice-fish farmers seem to prefer fish monoculture.
- b) If Region III and Center data are combined the goal of 1,837 mt from intensive culture is attainable by 1985. The demand for fingerlings exceeds the supply (Director Frank Pili, November 10, 1983). There is definitely a strong trend in the private sector for expansion of freshwater aquaculture.

C-1 Logframe Goals

A fully organized and operational Center for Central Luzon that:

- a) produces and distributes fish seed to rice-fish farmers and fish pond operator;
- b) extends freshwater fish hatchery-aquaculture technology to farmers; and

- c) trains extension workers and farmers in freshwater fish hatchery aquaculture technology and extension workers in extension principles and skills; and

C-2 Logframe Measurement of Goal Achievement

- a) Twelve extension workers trained for specialized key positions and assigned to FFH-ETC by end of 1981; 12 freshwater extension workers assigned to provinces, Region III by end of 1981; the Center producing and distributing to farmers 12 million fish seedlings/year by end of 1981 and 20 million/year by end of 1983.
- b) Two thousand four hundred farmers by the end of 1981 and 7,500 by the end of 1983 practicing freshwater aquaculture. Private fish hatcheries producing 40 million freshwater fish seed/year by end of 1981; 40 extension workers and 100 farmers trained by the end of 1983.

C-3 Assessment - Mid-term Report

As of January, 1982, eight BFAR personnel had received training in the U.S.A.; four were studying for masteral degrees at TAMU and 41 extension technicians had received a one week freshwater aquaculture and extension administration course. Outputs for training, 40 extension workers and 100 farmers by the end of 1983 potentially can be achieved. However, the fish seed output of the Center is not realistic. Given the present planned pond area of about 9.7 ha. and assuming production of 15 g fingerlings for rice pond stocking, the production of 8-10 million fingerlings annually from five crops is a more realistic target. Higher numbers can be achieved by reducing the size of fingerlings to be distributed.

The logframe assumption for achieving project outputs are:

- 1) The Center is constructed on schedule.
- 2) Trained extension workers will be assigned to and will serve at key posts in Central Luzon for at least 3 years after completing special training.
- 3) The GOP agencies will place high priority on increased freshwater fish production and be responsive to improving coordination of land-water resources.

Construction is about 18 months behind schedule; therefore assumption No. 1 is no longer valid. Assumption No. 2 may still be realistic. However, it was noted that the majority (60-75%) of the extension workers trained are females. Assumption No. 3 is generally realistic. However, coordination among the GOP agencies could still be improved.

C-4 Assessment- Final

- a) The Center physical plant is essentially complete and was in production three months before the end of the project period. For the work unfinished to date see discussion on the hatchery,

and extension components (Part IV and V of this report). The annual production goal of 8-10 million fish seed has not been reached as seed production in 1982 was 3,109,336 while the seed production in 1983 was 2,624,074 for the first nine months. Of the seed harvested in 1982, 38.6% were distributed. In 1983, 97% of the fish harvested in the first nine months were distributed. A discussion of factors affecting the failure to achieve numerical targets of fish seed is given in the Hatchery Component. Although staffing of the hatchery component is incomplete, personnel in place are functioning effectively and appear capable of achieving the production goals and extending their knowledge and skills to others.

- b. As of October 31, 1983, the Center distributed a total of 2,558,193 fingerlings.

A total of 622 fish farmers were serviced by the field extension team of the Center during the first nine months of 1983. Forty-one BFAR technicians and 89 fish farmers were trained during the same period.

The extension outreach of the Center has been limited by the lack of personnel and logistical constraints. Only six extension workers are assigned of the 12 indicated in the logframe. Difficulties in the operation and programming of two jeeps and four motorcycles for mobility have been cited.

A reexamination of the extension approaches of the Center to effectively serve fishfarmers in the region with its limited resources is recommended. A more centralized system of fingerlings and services delivery is needed. Closer coordination with the extension workers of the region is essential.

The Center has satisfied the logframe in training BFAR extension workers. Training manuals, now under preparation, need to be completed. Training of fish farmers, however, has to be accelerated. With the completion of the Center's training, facilities and increased staffing, it can easily meet its target for 1983.

D.1. Project Inputs

- | | |
|---|-----------------------|
| USAID | GOP |
| - Commodities | - Capital Improvement |
| - Technical Assistance | - O&M Costs |
| - Project Management, Operation, Evaluation | - Other Costs |
| - Participant Training | - Trust Fund |

D.2. Implementation Targets

| | <u>Yr. 1</u> | <u>Yr. 2</u> | <u>Yr. 3</u> | <u>Yr. 4</u> | <u>Yr. 5</u> | <u>Total</u> |
|---|--------------|--------------|--------------|--------------|--------------|--------------|
| 1. <u>USAID (\$000)</u> | | | | | | |
| a) Commodities | 375 | 110 | - | - | - | 485 |
| b) Tech. Assistance | | | | | | |
| Long-Term | 64 | 170 | 120 | 3 | 3 | 360 |
| Short-Term | 70 | 40 | 20 | 30 | 40 | 200 |
| Campus Support | 5 | 5 | 2 | 3 | 5 | 20 |
| c) Project Mgt., Operations, Evaluation | 77 | 96 | 42 | - | 15 | 230 |
| d) Part. Training | | | | | | |
| Long-Term | 72 | 61 | - | - | - | 133 |
| Short-Term | 72 | - | - | - | - | 72 |
| TOTALS | \$735 | \$482 | \$184 | \$36 | \$ 63 | \$1,500 |

| | <u>Yr. 1</u> | <u>Yr. 2</u> | <u>Yr. 3</u> | <u>Yr. 4</u> | <u>Yr. 5</u> | <u>Total</u> |
|----------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 2. <u>GOP (P000)</u> | | | | | | |
| a) Capital Improv. | 5,700 | - | - | - | - | 5,700 |
| b) O & M | 400 | 650 | 760 | 800 | 900 | 3,510 |
| c) Others | 5 | 75 | 85 | 85 | 85 | 335 |
| d) Trust Fund A | 376 | 278 | 158 | - | - | 812 |
| e) Trust Fund B | 210 | - | - | - | - | 210 |
| TOTALS | P 1,781 | 1,003 | 1,003 | 885 | 985 | 10,357 |

D.3. Assessment - Mid-Term

Needed project funds have been forthcoming on a timely basis. Whereas the logical framework calls for a GOP contribution of P10,357,000, in actuality the GOP has obligated P23,632,000 to the project. At present, there is no shortage of GOP funds; however, some delays have occurred in expending these funds.

D.4. Assessment - Final

Pursuant to Amendment No. 3 signed by the GOP and AID, the revised financial plan for the project increased the grant amount

by \$200,000 resulting in a total AID input of \$1,700,000. Likewise, the GOP obligation of P23,586,000 is more than what the logical framework states (See Annex D).

Needed project inputs are reportedly provided on a timely basis. Commodities provided under the project are of reasonable quality. However, there appears to be some problems regarding availability of spare parts for some of the vehicles.

IV. HATCHERY COMPONENT

A. Organization and Staffing

The staffing pattern for the fish seed production hatchery is shown in Annex E. Onsite direction is provided by the project manager to the hatchery management officer, a position vacant at the time of the evaluation. Duties of the hatchery manager are being performed by the pond management officer whose position in the Center is not yet permanent. Plans are underway to assign him permanently at the Center. A fish distribution officer, a fingerling production officer and three junior fishery biologists direct 15 to 30 laborers who perform the routine duties of fish production and maintenance of the production facilities.

B. Physical Plant

Fish seed production facilities and status at time of evaluation include the following:

- 1) Water reservoir ponds, 2 of 1.0 ha. each, complete and in service.
- 2) Broodstock ponds, 12 of 0.45 ha. each, complete and in service.
- 3) Primary rearing (nursery) ponds, 30 of 600 m² each, complete and in service.
- 4) Secondary rearing ponds, 16 of 1300 m² each, complete and in service.
- 5) Water supply and drainage for 11.28 ha. of ponds including two deep wells plus two elevated water storage tanks, complete and in service except for a second well which does not have the water pump installed.
- 6) Hatchery building containing 20 spawning and hatching tanks, complete but not in use.
- 7) Fish holding and shipping building, complete except for aerators screens, graders, etc.
- 8) Wet laboratory-aquarium building, complete but unfurnished. Not used for specified purposes.
- 9) Administrative building complete and in service.
- 10) Vehicle storage and shop building complete and in service.
- 11) Staff Housing, two single family and eight duplex units. Incomplete, not in service.
- 12) Roads and drainage, incomplete partially in service.
- 13) Perimeter fencing, incomplete, not in service.

The primary water supply is the National Irrigation Administration (NIA) irrigation canal which is located adjacent to the site with inlets to the two reservoir ponds. Secondary water supply is two deep wells about 100 m deep. Water from the wells can be pumped into elevated storage tanks or directly into the reservoir ponds. One well presently is equipped with a 1,000 liters/min electrically powered pump.

Ponds have the supply inlet at shallow and deep ends. The rearing ponds have 5.08 cm/inlets with gate valve while the 0.45ha/ ponds are equipped with a 10.16 cm pipe at the shallow end and a 5.08 cm pipe at the deep end. Each pond has a concrete seining basin about 45 cm deep connected to a chimney outlet which is fitted with a 20.32 cm diameter drain and three sets of screen and stop log slots. Ponds drain into a main line 50.8 cm diameter which empties into a drainage canal at the southwest corner of the pond area.

The hatchery building floor pond area is 375 m² and contains 10 spawning tanks 5.1 x 1.65 x 1.0 m plus five (double compartment) hatchery tanks 5.1 x 3.0 x 1.0 m for a total tank area of 160.65m².

A wet laboratory-aquarium building having 375 m² floor area has been completed but is functioning as living quarters and storage. Office space for the hatchery is provided in the administration building and consists of about 1/3 of the floor space of that building.

The fish holding building contains eight tanks measuring 4.7 x 1.5 x 1.0 m and 10 tanks 9.7 x 1.5 x 1.0 m each having two 2.54 cm water supply pipes and a 7.62 cm floor drain. The open building has a center driveway and elevated ramps on the outside of the tanks for ready access.

Related facilities include two staff housing units, single family size, plus eight staff housing units duplex size. An administrative building and a maintenance building are shared with the extension and training functions. Perimeter fencing and a roadway system complete the hatchery facilities.

In general, it appears that the fish seed production facilities are well designed and adequate to enable the mission of the hatchery to be fulfilled. The 9.28 ha. of production ponds will require multiple cropping each year for achieving target goals. Any increase above the 8-12 million annual fingerling production projection will necessitate a change in the production system to one of more intensive management.

Earthwork of the pond system is substandard in some instances. Nine of the 12 spawning rearing ponds reportedly do not drain completely. Free board of the dikes is excessive in some

instances and top width of the dikes is not uniform. Grade of top of dikes was not maintained especially around the manholes and valve boxes. As many as eight manholes have been broken during construction and need repair. The water supply pipes at the deep end of the pond need to be anchored at or near the valve to minimize breakage. Some breakages have already occurred.

Because the fish holding building is not usable, seed and brooders must be held in hapas installed in production ponds. This temporary arrangement is expensive in terms of labor and materials for hapas. It also raises the possibility of contaminating the pond being used for the hapas with unwanted species of fish.

One of the most striking deficiencies observed is the condition of the main access road. The condition alternates between mudholes in rainy periods and dust clouds in dry weather. The grounds adjacent to the buildings remain unfinished, bare of grass, ungraded and with a minimum of walkways. Perimeter fencing is estimated to be about 60-65% complete with only a 6-man crew at work on the day of inspection.

Housing for key staff personnel, including that of hatchery workers, is unfinished. Although the design and quality of construction appear sound.

Surfacing of pond driveways with gravel is only partially complete. Large stones in the mix present a safety hazard and could damage a passing vehicle. Ruts made by traffic during wet weather will retain water at the next rain and soon make the driveway impassable under normal traffic loads.

The water supply system for the ponds appears to be inadequate for optimum production requiring careful water management. The operational well has a reported pump output of 1,000 liters/minute. With continuous pumping, this amount of water should furnish the minimum water requirements for the facility if no intentional water exchange is done. A drought has resulted in shortages of water from the primary supply, the NIA irrigation canal, forcing more use of pumped well water. Contingency funds for electricity for pumping water should be budgeted each year so that pumps can be operated as needed. Additionally, larger water inlet gates are needed from the canal into reservoir ponds to admit as much water as possible when the water level in the canal is high enough to permit a flow into them. It is recommended the capacity of the inlet volume should be increased at least three fold.

C. Fish Seed Production

Fish seed production to date has involved several sizes of the species T. nilotica. Several strains of this species have been propagated and some performance testing done. Additionally,

juveniles of the common carp, Cyprinus carpio, has been reared to sexual maturity.

The production system selected was the spawning-rearing pond method with partial harvest by monthly seining of the full pond after an initial 60-70 day production period. The original plan was to terminate the production cycle after 180 days, drain the pond for complete harvest and restock for another crop. Enrichment was through the use of an organic-inorganic fertilizer combination of chicken manure (3,000 kg/ha/mo) and 16-20-0, N:P:K: (100 kg/ha/mo).

For production of large (size seed post fingerlings) small fingerlings 2-5 g size were stocked in fertilized secondary rearing ponds at rates ranging from 150,000-230,000/ha for a period of about 75 days for growth to a size of 10-20 g.

Yield from this approach has ranged from good to excellent. The fertilizer schedule has produced an adequate supply of natural food resulting in heavy initial spawning and rapid growth. A shortage of labor and water delayed total harvest of some spawning-rearing ponds for 6 months or more on occasion. At the time of the evaluation three ponds had been in production 300-370 days without draining, four for 270-275 days, and six for 90 days or less. The delay in complete draining has substantially reduced the numerical production of fingerlings and the extra monthly seining for partial harvest probably decreased the number of seed per man hour expended. As a result, annual yield has not yet achieved the target levels set for the facility. Annex F shows the T. nilotica seed production by month for a 12-month period, September 1982 through August, 1983. The total yield of 3,344,691 is less than 50% of the projected yield of 8-12 million fingerlings deemed possible. Mean size of this output was 7.7g. In July and August, 1982, however, 1,316,140 fish weighing 6,381 kg were harvested with a mean size of 4.8 g. If maintained for 12 months, this would be an annual production rate of 7.9 million fingerlings, assuming that mean size of fingerlings harvested is reduced by 50% and the production ponds are recycled every 3-4 months. As stated in the mid-term report, adopting a combination fry and egg transfer method along with a mean size fingerling of about 2 g would offer a further significant increase in numerical output.

The fertilization plan being used is giving excellent results. However, it is suggested that production trials comparing daily application of organic fertilizer (chicken manure) supplied at a rate of 5-10% of fish body weight stocked and adjusted at 10-14 day intervals be compared with the monthly fertilizer application. Results of experiments at Auburn University rearing fry to a size of 1-2 g show that gains of 35-45 kg/ha/day are possible making this a possibility for increasing yields from both the spawning-rearing ponds and the rearing ponds.

Shortages of organic fertilizer reportedly have occurred because of delay in payment of the supplier. This payment delay also is the reason for the scarcity of labor. Aside from the drought, insufficient funds for electricity of pump operation have also contributed to the water shortage.

Personnel seem to be well trained in the methodology of harvesting, grading, inventorying and storing fish prior to shipment. Distribution (dispersal) equipment is modern and personnel appear to be proficient in its use. Data on loading rates and distances to which loads were hauled were not available. As the hatchery continues operation, attention should be given to increasing efficiency in both production and distribution so that available inputs will yield the most economical output in terms of fish seed delivered to the using public

The system of inventory and record keeping of fish seed produced appears to be well set up and efficiently maintained. Present stocks of fish appear to be adequate to meet current demand. Application requests are reported to be filled within 2 weeks of receipt. Delivery total of fingerlings during the week of November 6, 1983 was 77,983; of this number 48,880 were picked up at the hatchery by the recipients while 29,103 were delivered by station personnel. On November 14, about 22,000 fish were dispersed and 118,000 more were available for delivery.

If and when propagation of common carp begins, this culture will likely be done during the cooler months of the year when tilapia spawning has slowed down. The production cycle for 5 cm (2 g) size fingerlings is about 40-60 days. Growth rate of common carp species is as good or better than tilapia in the same stage of development once feeding begins. This additional output should substantially boost the total output of fish seed.

D. Supplies and Equipment (Commodities)

Equipment received from USAID for hatchery use included the following:

1. 1 ton Truck, with 8 compartment fish hauling tank equipped with electric agitators and bottled oxygen aeration (2 units).
2. 3/4 ton Truck for general hauling (1 unit).
3. A CJ-8 Jeep (1 unit)
4. Hand tractor (1 unit)
5. Large tractor with sickle bar mower, rotary mower back-hoe, front-end loader and grader blade (1 unit).
6. Agitators and aerators for holding and transportation fish
7. Maintenance tools
8. Seines and nets for harvesting fish
9. Water quality analysis instruments
10. Water pumps (5)
11. Microscopes (12) plus 2 Zeiss laboratory microscopes
12. Feed preparation equipment

13. Emergency electrical generators
14. Chemical sprayers
15. Sewing machine for net repair and construction
16. Oxygen meter YSL continuous recording.

In addition to these equipment, Center personnel have constructed 22 fish holding-rearing cages which are installed in the reservoir pond. Fish holding hapas sufficient to hold the output of fish from 1-2 production ponds have been built and placed into service. Twelve fish hauling boxes with a capacity of 340 liters have been constructed for hauling smaller quantities of fish. Fitted with a single 12-volt agitator powered by the hauling vehicles's electrical system, a hauling box may contain up to 50 kg. of fish for periods of 12 hours or more. These containers are transported in the back of the hatchery jeep or can be rented by applicants for hauling fish in their vehicles.

Some concern is felt for maintenance of equipment and facilities. Basis for this is the observed condition of the sickle bar mower, an attachment for the farm tractor and two vehicles which were not operational at the time of the inspection. The 3/4 ton truck was out of service during the 10 days the Team spent at the Center as was one of the jeeps. Both vehicles were showing obvious signs of deterioration although the highest odometer reading noted was 32,000 miles.

In summary, great progress has been made by the hatchery staff in achieving a full production output. Continuation of these endeavors during the next calendar year should realize this goal.

V. EXTENSION COMPONENT

A. Organization and Staffing

The field extension team (FET) of the Center is made up of 10 members consisting of one extension outreach specialist, one pond and hatchery management specialist/rice-fish specialist, two pond construction specialists, four extension agents and two support personnel. The FET is further complemented with a technical support staff of one fish health management specialist, one aquaculture economics specialist, one extension communication specialist and a training coordinator. A member of the FET has been designated as regional extension coordinator to unify the extension efforts in freshwater fisheries of the region. The present extension staff of the Center appears to be adequate.

B. Facilities

The Center has adequate office facilities for its extension staff. A lecture room with a seating capacity of 40 is at present being utilized. An indoor wet laboratory has been completed but is underutilized. The dry laboratories for water analysis and fish biology/pathology are not yet operational. Installations for the operation of the outdoor wet laboratory have yet to be completed.

Temporarily, trainees of the Center have been lodged at the FAC dormitory, pending the completion of the Center's housing facilities.

When completed the Center's training facilities will strengthen the practical aspects of training programs and support the technical assistance services (e.g. water testing and fish disease diagnosis) of extension agents.

C. Commodities

Most of the equipment purchased by TAMU have been delivered. However, a complete listing of the equipment for extension/training was not available at the time of the evaluation.

Maintenance and logistical problems are encountered by the extension staff. For instance, mimeographing machines in disrepair have delayed the printing of handouts. Most of the slide projectors are not in working condition. Some of the extension specialists have complained about the difficulty in obtaining vehicle support for field visits.

D. Extension/Training Programs

For 1982, the Center serviced 470 cooperators and conducted 538 extension visits. Technical assistance on hatchery management, water analysis, fish diseases, pond management and site evaluation was extended to fishpond, hatchery, and rice-fish culture operators. In the same year, the Center conducted a familiarization and orientation seminar for 155 BFAR extension officers. The seminar covered topics on hatchery management, extension methodologies, fish diseases, water quality, fish nutrition, fish hauling and distribution. From January to October, 1983, the Center conducted 753 extension visits and extended technical services to 622 fish farmers (Annex G).

The application of the result demonstration technique in the extension outreach program of the Center appears to be effective. As of October 31, 1983, there were 42 demonstration projects (Annex H) on various types of fish culture established and directly supervised by the Center. Visits conducted by the Evaluation Team to some of these demonstration projects showed very positive interest of farmers on the technologies (i.e. backyard fishpond, rice-fish and fish hatchery) extended by the Center. It was, however, noted by the Evaluation Team that information on farm input and production data were generally lacking. A socio-economic study on the Center's cooperators is needed.

The field extension team of the Center renders technical assistance to farmers through fishpond evaluation, extension visits and fish deliveries. Four motorcycles and two jeeps are used by the team for field visits and fish deliveries. Members of the team also serve as lecturers in field seminars and Center-sponsored training programs.

Lectures on pond engineering, pond management, hatchery management and rice-fish culture conducted by the FET in Gen. Natividad, Nueva Ecija were attended by the evaluation team.

The field evaluation team holds weekly meetings to assess current activities and plan future ones. Among the problems identified by the group were lack of office supplies, delay in the payment of personnel salaries and difficulties in obtaining vehicle support.

The Center conducted 10 training activities for 89 fish farmers, students, Peace Corps volunteers, project personnel and other individuals in the first 10 months of 1983 (Annex I). This was seen by the evaluation team as an indication of the increasing involvement of the Center in manpower development for freshwater aquaculture in Region III and elsewhere. The Evaluation Team, however, observed that such training activities were conducted on a request-basis rather than programmed. Future programs should be scheduled on a regular basis. Training designs were prepared by the training coordinator. The Team recommends evaluation of the training methodologies and the preparation of manuals.

E. Fingerling Distribution

The Center distributed 2,558,193 tilapia fingerlings and breeders to 590 private fishfarmers and BFAR cooperators for the period January - October, 1983 (Annex J). With improved methods of holding and transport, fish losses have been very minimal.

The present delivery system for fish being practiced by the Center appears to be costly and inefficient. Fish are delivered on an individual - basis. Furthermore, there is a lack of a network of fish holding facilities in the region that can greatly improve the Center's fish distribution system. With the increasing cost of vehicle fuel and maintenance, it is highly recommended that delivery of fingerlings/breeders by the Center be centralized. By establishing provincial hatcheries/holding facilities, the Center can deliver fish to these satellites on a regular and/or need basis. The provincial hatcheries will then be responsible for the distribution of the fingerlings/breeders to the fishfarms.

F. Management Techniques Advocated for Farmers

The Center extends the technologies for backyard tilapia culture in ponds, rice-fish culture and cage culture to farmers. Techniques for management of these culture systems are well-defined in hand-outs and lectures presented by extension workers to farmers and cooperators. In the field visits of the Evaluation Team, management techniques for backyard fishponds, tilapia hatchery and rice-fish culture were validated.

For fishponds, a stocking rate of 2-3 fingerlings/m² is recommended by the Center. Pond fertilization is applied using

of 3,1
fertilizer (16-20-0) at 100 kg/ha/month. Fish are harvested at
3-4 months. Table-size fish and fingerlings constitute the major
production outputs.

An economic evaluation of the
the Center needs to be done. The study should determine whether the
technologies recommended by the Center are economical.

Opinions and Attitudes of Farmers

There is a general preference of farmers for
tilapia pond culture over rice-fish culture. The reasons given by
farmers, include better income and easier management for culture of
tilapia only. The strain of Tilapia nilotica produced by the Center
has been well-accepted by farmers. It is now preferred over T.
mossambica and "tilapia hybrids" that once dominated backyard and
commercial fishponds in the region. In future work, it is highly
recommended that socio-economic aspects be considered in the
evaluation of cooperators.

Brochures

The Center has prepared an
information brochure on the Center. Some technical manuscripts such
as those for pond culture, cage culture, and rice-fish culture have
been reproduced and given as handouts to trainees and cooperators.
The technical manuscripts require further editing for technical
accuracy and style before publication as brochures and extension
literature.

VI. PROJECT ADMINISTRATION

A. Project Structure

1. Organizational Set-Up

The Center is headed by a project manager
units under him. He is directly responsible to the Director of the
BFAR through the project coordinator who is also the Chief of the
Fisheries Extension Division of the BFAR Central Office. The three
major functional units include the fish hatchery unit,
administrative unit, and the fisheries extension unit (Annex E).
The hatchery unit is headed by a hatchery management officer. This
unit has three members consisting of a pond management specialist,
fish distribution specialist and fingerling production specialist.
The administrative unit, headed by an administrative officer, is
composed of a project accountant, liaison officer, supply officer,
general services officer, motorpool maintenance officer, clerk
typists and janitors. The fisheries extension unit, concurrently
headed by the project manager, is composed of eight highly-trained
specialists. The expertise of this unit includes pond and hatchery

management, fish health management, pond construction outreach, rice-fish culture, aquaculture economics, extension outreach, training and extension communication. The project manager coordinates closely with the USAID project officer assigned to the Project and the TAMU consultants. Presently, TAMU is represented by one long-term hatchery management advisor.

2. Functional Set-Up

Project administration and management are the main responsibilities of the project manager. The administrative unit provides assistance to the project manager in terms of securing all the necessary supplies and materials, control and maintenance of project vehicles, building facilities as well as official communication to and from the project.

The hatchery management unit is essentially tasked with meeting the objectives of the project to produce sufficient fingerlings to meet the needs of rice-fish farmers and fishfarmers. Furthermore, it is assigned to develop and implement an appropriate scheme on fingerling production, pond management and fish distribution.

The extension unit consists mainly of five functional sub-units, namely, fisheries extension, fish health management, aquaculture economics, training, and extension communication. The FET is charged primarily with establishing demonstration projects on rice-fish culture fishpond, fish hatchery, fish cages, and other fish culture practices in coordination with the BFAR Regional, Provincial and District Offices. This essentially involves technology dissemination and provision of technical assistance and guidance to target project beneficiaries. The FET is also charged with establishing and coordinating linkages with various government and banking institutions involved in freshwater fisheries development within and outside Region III.

The fish health management group is concerned with assisting the extension activities of the Center particularly in field testing and technology verification of existing fish culture practices with special emphasis in fish diseases, fish nutrition and water quality. The group makes use of laboratory facilities in carrying out its role.

The extension communication group is responsible for the conduct of communication research and development as well as the promotion of technology adopted by the Center. This involves the use of audio-visuals, promotional materials and supplies, and printing of technical manuscripts. It is also supposed to maintain linkages with the broadcast and print media.

The aquaculture economics group is responsible for the economic evaluation, preparation of feasibility studies of aquaculture projects including cooperator demonstration projects, baseline and impact evaluation surveys and socio-economic studies.

The extension training group implements the various training activities of the Center including on-the-job-training and short/long term training of Regional, Provincial and District extension workers of the impact area. This group works closely with the Freshwater Aquaculture Center of CLSU on the use of expertise and facilities.

B. Manpower Resources and Development

1. Existing Personnel Profile

There are about 66 manpower complement at the Center broken down as follows: (based on government position classification):

| | |
|--------------------------------|----|
| Chief, training specialist | 1 |
| Supervising fish technologists | 1 |
| Specialist II | 1 |
| Training specialists | 5 |
| Senior fishery biologists | 7 |
| Fishfarm manager | 1 |
| Economist | 1 |
| Fishery biologists | 4 |
| Junior fishery biologist | 1 |
| Fishery aides | 9 |
| Casual employees | 10 |
| Laborers | 25 |

Of the above, 31 hold permanent positions while the rest are temporary in terms of status of employment. Of the permanent employees, four occupy items belonging to other BFAR units outside the project. The key project personnel includes the chief training specialist (occupied by the project manager) down to the fish farm manager. The rest act as support staff in the various activities of the key personnel. Of the 16 key staff, eight have received various short-term training courses in the U.S. under the Project. Four underwent formal training leading to a masteral degrees at TAMU. These key staff occupy positions ranging from the project manager, aquaculture economic specialist, down to the aquaculture engineer. Presently, most of the individual key staff are apparently highly competent in his/her respective assigned tasks. This is important to ensure project success in achieving its stated objectives. However, two of these key staff are reportedly assigned in other BFAR units outside of the project. Their reassignment back to the Center in the immediate future appears doubtful.

2. Staff Perceptions

The following perceptions are based on the interviews/discussions conducted with most of the key staff and some support staff members:

a) Opportunities for growth and professional advancement

Due to the limited number of approved staff positions for the Center, most of the staff interviewed perceive limited opportunities for promotions within the next few years. Further trainings in related areas including masteral studies are highly desired by both key personnel and technical support staff. The staff likewise indicated willingness to participate actively in related workshops/seminars to increase their knowledge and skills.

b) **Financial and Economic Aspects**

The staff views the free allocation of housing facilities as a good motivating factor. With the present salary scales, most would like to engage in other related activities such as teaching part-time at the College of Inland Fisheries of CLSU. The majority indicate the need for the reinstatement of allowances previously given to them. Those with temporary employment status desire security with their jobs. The laborers continue to work despite delays in the payment of their wages.

c) **General Working Conditions**

The working relationships among the staff appears generally satisfactory. However, most have expressed that attention be given to the following:

- 1) The present situation appears to be heading toward individual efforts in carrying out the services and activities of the Center rather than as a team. There is a need to stress team effort.
- 2) The operations manual for the Project needs to be implemented fully.
- 3) There is a strong desire by the staff for the project manager to be in the Center more often for guidance and supervisory purposes. While each staff member is technically competent in discharging his/her assigned function, there seems to be a need for stronger guidance in the overall, planning and implementation of the work programs.
- 4) With the tendency of specialists to have a compartmentalized outlook in their respective role, the present level of coordination among the units is quite inadequate.
- 5) The present working environment could still be improved to make it more conducive and challenging to work in.

C. **Logistics and Other Support Services**

1. **Administrative Support**

The smooth operations of the Center particularly for the hatchery production and extension services depend greatly on the administrative support available especially in terms of procurement of supplies and operational inputs such as chicken

manure, fuel, among others, as well as the proper maintenance of project vehicles. Presently, such support services are hampered by tedious paper work particularly in the processing of Request and Issuance Vouchers (RIV) and Purchase Order (PO). The average length of processing takes about 5 to 7 weeks. This leads to inadequate operational inputs necessary to execute work programs. Furthermore, with most of the administrative personnel spending much time in Manila to follow-up the RIV's and PO's, other administrative requirements in the project are not well-attended to. This problem is further aggravated by the prolonged stay in Manila of the assistant administrative officer who took over the responsibilities of administrative officer who in turn was earlier reassigned to the BFAR Central Office.

2. Budgetary Aspects

At the present, there is sufficient financial resources necessary to support project activities. However, delays in the release of funds compounded by the long processing period of RIV's and PO's hamper timely delivery of fingerlings and extension services to the Project target clientele. With the present economic difficulties faced by the country, the belt-tightening measures of the government will surely affect operations of the Center in the immediate future.

3. Vehicles

Among other equipment, the vehicles play a major role in the implementation of work programs. There are supposed to be 26 vehicles in the project consisting of the following:

| | |
|-------------|----|
| Motorcycles | 15 |
| Jeeps | 8 |
| Truck | 1 |
| Pick-Up | 1 |
| Tractor | 1 |

Eleven motorcycles are reportedly assigned to the key specialists including the supply officer. Three are assigned to BFAR Provincial and District Offices. The one reportedly at the BFAR Central Office is present being recalled to the Center. It was gathered, however, that some motorcycles are not fully utilized for carrying out Project objectives due to breakdowns and that some are not really used in extension work.

The eight jeeps are used as follows: two for extension, one for the project manager, one for the hatchery unit, one for the construction group (buildings and housing facilities) which shuttles between Manila and the Center, one for general use of the staff, one at the BFAR Region III Office, and one in Manila.

The maintenance of vehicles is supposed to fall under the jurisdiction of the administrative unit. Since the unit is

preoccupied with other administrative matters, a more practical arrangement has been recently introduced. The persons in the unit to which the vehicles are assigned are responsible for the maintenance of the vehicles. Initial expenses shall be shouldered by the concerned staff and this will be reimbursed by the administrative unit. These pose certain problems since most staff members may not have readily available financial resources. Other problems encountered in the use of vehicles include the inadequate supply of fuel, spare parts and occasionally, lack of coordination in the scheduling of the use of the vehicles. As noted earlier, the tedious process of having RIV's and PO's approved affects the efficient utilization of the vehicles.

D. Analysis and Recommendations

1. Existing Set-Up

While the organizational and functional set-up of the Project is clearly delineated by the operations manual, in reality, a lot of improvement is apparently needed to fully operationalize the manual. The move of the project manager to designate a specialist to the position of hatchery management officer should be supported. The present hatchery management officer has been reportedly away from the Center for quite sometime and his return could not be ascertained. Likewise, the newly designated head of the administrative unit should be required to report to the Center site regularly. The internal flow of communication within the project organization need to be clearly defined so as to avoid the lack of coordination among the various units. As it is, certain information and decisions taken affecting the staff are not effectively conveyed to all staff members.

2. Manpower Resources and Development

- a) There is a strong need to further enhance the awareness of personnel on their respective roles in the Center and how it relates to the development of freshwater fisheries in the country, particularly on extension and hatchery operations.
- b) Further training, of staff members in related fields and enrollment in the masteral programs at CLSU should be encouraged. This will not only increase the knowledge and skills of the staff but also contribute to their personal career development and growth.
- c) Qualified staff members should be encouraged to teach part-time at CLSU provided their regular work at the Center not jeopardized. This would require those who teach to put in more hours than a regular work week.
- d) Creation of higher job positions within the Center should be supported in order to allow promotions and to remove the apprehensions of most staff members on the lack of positions to be promoted to.

- e) The apparent attitudes of most of the staff members should be geared more towards team effort rather than individual efforts. Team-building trainings should probably be undertaken.
- f) The diverse areas of specialization of individual key staff members will require a unifying factor. The project manager should conduct staff meetings regularly to provide a forum for establishing stronger coordination among the project units.
- g) An appropriate incentive mechanism (i.e merit pay increases) should be explored and introduced if feasible.

3. Logistics and Support Services

- a) Additional support staff is needed particularly in the administrative unit and the extension communication unit.
- b) Streamlining of the processing of RIV's and PO's to insure adequate and timely delivery of supplies, materials and fuel to the Center is needed.
- c) Funds should reality be available for the maintenance of vehicles as well as for emergency purchases. It is suggested that the administrative officer be responsible for the cash advance.
- d) Work programs should be formulated within the available financial resources allocated on a quarterly basis. Such programs, which should include a schedule on the use of equipment, facilities and vehicles, must be strictly followed.
- e) The practice of reallocating or sub-allocating resources i.e fuel, vehicles) that would adversely affect the regular activities of the project should be avoided.
- f) The present use of resources, particularly the motorcycles and jeeps, needs to be increased to the maximum. There is a need to assess the present assignments of such commodities to determine the most efficient and effective arrangement to effect maximization of available resources.
- g) The possibility of constructing gasoline storage facilities at the Center should be studied. This will prove more economical in the future in view of the storage fee of P0.10/liter being paid to the gasoline station. However, tight control over the use of gasoline is a must.
- h) A more systematic and practical arrangement should be made in the follow-up of papers for RIV and PO's at the Central Office. The amount of time in terms of man-hours spent by three administrative personnel (the acting administrative officer, project accountant and supply officer) in Manila is quite significant.

VII. COOPERATION AND ATTITUDES OF GOVERNMENTAL AGENCIES AND RELATED GROUPS

There are several government agencies as well as other institutions and private entities concerned with the Project. Significant improvements

have been in the linkages of the project with other agencies. Briefly described in the following are the relationships and existing areas of cooperation among them:

A Agency Linkages

- 1) Ministry of Natural Resources (MNR) - Agencies within this Ministry are directly involved with the project. Keeping close watch on essential development programs within its jurisdiction, the MNR formulates the required policies and guidelines for the offices under it.
- 2) Fishery Industry Development Council (FIDC) - This is the policy and planning arm, in fisheries of the MNR.
- 3) National Food and Agricultural Council (NFAC) - The Centers project manager and TAMU extension advisor have served on the national rice-fish coordinating committee based at the Ministry of Agriculture.
- 4) FAC-CLSU - A memorandum of agreement between CLSU and BFAR was signed sometime in April, 1983. Broodfish and fingerlings have been exchanged. Personnel of the FAC and the Center maintain close informal professional contacts. FAC staff member have served as resource speakers for the Center's training programs.
- 5) CIF-CLSU - Undergraduate students from the CIF, CLSU have received practical training at the Center. TAMU advisors have served as guest lecturers in graduate and undergraduate courses.
- 6) Ministry of Agriculture (MA)- Bureau of Agriculture Extension (BAEx) - Staff of the Center coordinates closely with MA extension agents and participate in MA training programs in rice-fish culture. MA agents have been also supplied with fingerlings and joint rice-fish demonstrations were established.
- 7) Philippine Council for Agriculture and Resources Research and Development (PCARRD) - The project manager and TAMU advisors have worked closely with PCARRD in the development of a national broodstock improvement program.
- 8) National Irrigation Administration (NIA) - The availability of water for agriculture in certain focal areas depends upon this agency which is involved in the development and use of irrigation water for agriculture. Compatible and coordinated use of the water supply are necessary in the rice-fish culture activities.
- 9) Ministry of Human Settlements (MHS) - The Center has been involved in the National Livelihood Program (KKK) of the GOP in Regions I, II, and III. The Center continues to provide technical assistance and supply of fingerlings.
- 10) Land Bank of the Philippines - The Center assists and provides technical guidance to small-scale fish farmers in securing credit from the bank.
- 11) Farm Systems Development Corporation (FSDC) - The project staff of the Center extends technical assistance to rice-fish operators of irrigated riceland within the Integrated Services Association of the FSDC.

- 12) ICLARM - Staff and TAMU advisors have interacted with ICLARM in a broodstock improvement project. Fingerlings and broodfish were exchanged. Project staff have also participated in the ICLARM - PCARRD Symposium on the Economics of Tilapia Industry economics in the Philippines. Both the Center and ICLARM have plans for joint publications of technical data generated from the hatchery.
- 13) Southeast Asian Fisheries Development Center (SEAFDEC) - have exchanged information on broodstock improvement and tilapia spawning methods. Plans have been made for BFAR to cooperate with SEAFDEC on tilapia strain evaluation programs.
- 14) U.S. Peace Corps - The Center has provided training services and site evaluations for U.S. Peace Corps. Fingerlings were also provided for Peace Corps projects in Regions I, II, and III.
- 15) Other agencies working with the Center are:
 - a. University of the Philippines system
 - b. Maligaya Rice Research Center of the Ministry of Agriculture
 - c. Bureau of Animal Industry
 - d. Bureau of Forest Development
 - e. Technology Resource Center
 - f. Philippine Army
 - g. Philippine Federation of Aquaculturists
 - h. Ramon Magsaysay Award Foundation
 - i. Asia Foundation

B. Constraints

The growing number of agencies directly or indirectly interested in freshwater aquaculture, fingerling production, rice-fish culture and training has resulted in the need to establish a more effective coordinating mechanism. Since these agencies belong to different ministries and have varying short-term objectives, several constraints arise from such situation, to wit:

- 1) Lack of coordination at the operational level
- 2) Shortage of trained personnel
- 3) Uneven distribution of supply of fingerlings
- 4) Conflicts in use of inputs such as water

C. Cooperation, Coordination and Linkages

There is a need to establish a more effective coordinating mechanism at the operational level. In order to fully utilize the limited available resources, facilities and expertise could be shared. Techniques and information disseminated to the target clientele should be standardized by joint efforts of concerned agencies.

VIII FUTURE CONSIDERATION

(This entire section is included in the Executive Summary, Section I.D.)

ANNEX A

SCHEDULE OF EVALUATION TEAM

| <u>Date</u> | <u>Activity</u> |
|------------------|--|
| November 2, 1983 | Orientation of Evaluation Team at ORAD/USAID, Manila <u>Persons Met:</u> 1) Dr. Ralph J. Edwards, Chief, ORAD/USAID 2) Dr. Edward J. Rice, Chief, Agricultural Operations Division, ORAD 3) Mr. Jaime Correa-Montalvo, FFDP Project Officer 4) Mr. Noel Ruiz, FFDP Asst. Project Officer 5) Mr. Johnie H. Crance, Consultant to USAID/ORAD 6) Dr. Frederick van de Vusse, Consultant, NEDA Region VII |
| November 3 | Meeting with Mr. Felix R. Gonzales, Director of Bureau of Fisheries and Aquatic Resources, Manila to discuss the status of the Center <u>Persons Met:</u> 1) Mr. Abraham B. Gaduang, Chief, Extension Division, BFAR 2) Mr. Melchor M. Tayamen, Project Manager, FFH-ETC 3) Dr. Meryl C. Broussard, Jr., TAMU Advisor, FFH-ETC |
| November 4 | Trip to BFAR FFH-ETC in Munoz, Nueva Ecija <u>Persons Met:</u> 1) Dr. Amado C. Campos, President CLSU 2) FFH-ETC Technical Personnel |
| November 5 | Meeting with Dr. Meryl Broussard, TAMU Advisor |
| November 7 | Meeting with FFH-ETC Hatchery and Extension Staff to discuss scope of work of Evaluation Team |
| November 8 | Visits with cooperators of FFH-ETC in Nueva Ecija <u>Persons Met:</u> 1) Mr. Macario Salvador, Bagong Silang Talavera, Nueva Ecija 2) Mr. Florentino Santiago, Paludpod, Talavera, Nueva Ecija 3) Mr. Julie dela Cruz, Caalibangbangan, Cabanatuan City 4) Fishfarmers of Gen. Natividad, Nueva Ecija |
| November 9 | Visits with cooperators of Center in Tarlac and Nueva Ecija <u>Persons Met:</u> 1) Mr. Carlos Aquino, Concepcion, Tarlac 2) Mr. Pacifico Taroma, Anao, Tarlac 3) Mr. Zacarias Sanchez, Guimba, Nueva Ecija |

- November 10 Meeting with Mr. Francisco Pili, Regional Director, Bureau of Fisheries and Aquatic Resources, San Fernando, Pampanga to discuss regional programs and relationship with Center.
Persons Met:
 1) Ms. Consorcia Garachico, Provincial Fishery Officer, Nueva Ecija
 2) Ms. Celedonia Metrillio, Provincial Fishery Officer, Bulacan
 3) Mr. Rustico Cacho, Acting Provincial Fishery Officer, Pampanga
 4) Mr. Norberto dela Pena, Provincial Fishery Officer, Bataan
 5) Mr. Gertrudo, Arcigal, Provincial Fishery Officer, Tarlac
 6) Ms. Rhodora de Leon, Provincial Fishery Officer, Zambales
 7) Ms. Pacita Custodio, Supervising Fisheries Extension Specialist
 8) Ms. Sally O. Yanga, Fisheries Extension Specialist
- November 11 Meeting with Dr. Rodolfo G. Arce, Director, Freshwater Aquaculture Center, CLSU, Munoz, Nueva Ecija to discuss complementing programs.
- November 12-13 Drafting of Report
- November 14 Meeting with Center's Project Staff for preliminary report of Evaluation Team and five-year management plan
- November 15 Return to Manila and continuation of report drafting
- November 16 Meetings with Drs Richard Neal of ICLARM and Elvira O. Tan of PCARRD in Makati, Metro Manila and Los Banos, Laguna, respectively on introduction of freshwater aquaculture into upland rainfed areas and possible linkages with Center.
Persons Met:
 1) Dr. Ian Smith, Fishery Resource Economist, ICLARM, Makati, Metro Manila
 2) Mr. Cesar Pagdilao, Program Specialist PCARRD, Los Banos, Laguna
- November 17 Pre-exit meeting with USAID Officials to discuss preliminary report of Evaluation Team; discussed results of the socio-economic surveys conducted by Dr. Virginia Miralao and co-workers on the Center's cooperators.
- November 18 Meeting with Director Felix R. Gonzales and Center staff to discuss findings and recommendations of the Evaluation Team for the Five-year management plan.

November 19-20

Preparation of final draft of Evaluation Team's report

November 21-25

Final Review of Report

- MOB** - Ministry of Budget
- MPW** - Ministry of Public Works
- NEDA** - National Economic and Development Authority
- NFAC** - National Food and Agriculture Council
- NIA** - National Irrigation Administration
- ORAD** - Office of Rural and Agricultural Development
- PACD** - Project Assistance Completion Date
- PCARRD** - Philippine Council for Agriculture and Resources Research and Development
- PO** - Purchase Order
- RIV** - Request and Issuance Voucher
- SEAFDEC** - Southeast Asian Fisheries Development Center
- TAMU** - Texas A&M University
- UPCF** - University of the Philippines College of Fisheries
- USA** - United States of America
- USAID** - United States Agency for International Development

ANNEX D

FRESHWATER FISHERIES DEVELOPMENT PROJECT NO. 492-0322
AID GRANT AGREEMENT NO. 79-03

Revised Financial Plan (Obligations)

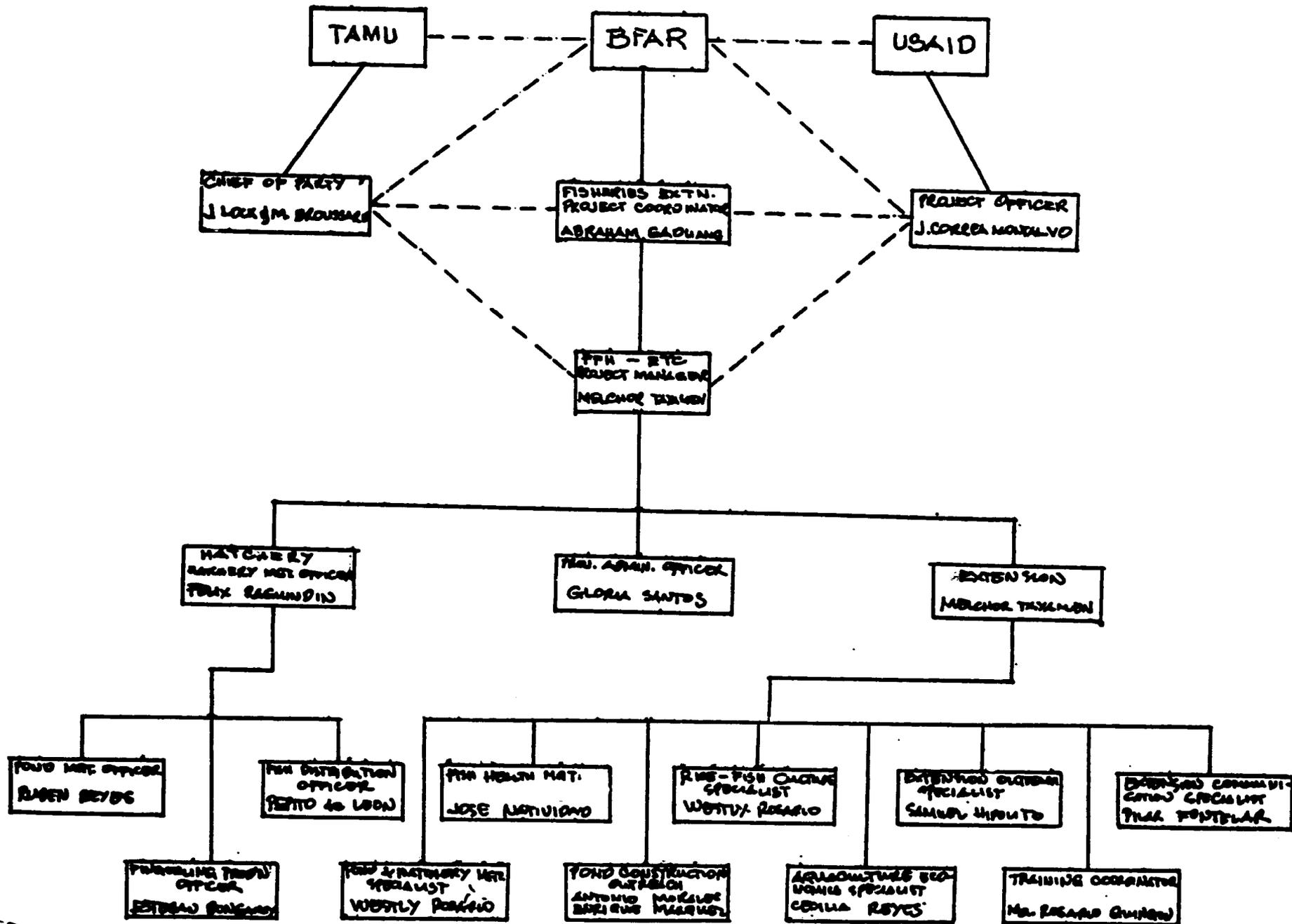
US Dollars (\$000)

| Project Element | FY 1979 | FY 1980 | FY 1981 | FY 1982 | FY 1983 | TOTAL |
|--------------------------|------------|--------------|----------|------------|----------|--------------|
| TAMU Contract | 233 | 824 | - | 125 | - | 1,182 |
| Project Officer Support | 77 | 123 | - | 75 | - | 275 |
| Commodities | 90 | 123 | - | - | - | 213 |
| Evaluation | - | 30 | - | - | - | 30 |
| TOTAL OBLIGATIONS | 400 | 1,100 | - | 200 | - | 1,700 |

Local Currency (P000)

| | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|---------------|
| Personnel Support (Peso Trust Fund "A") | 130 | 337 | 110 | 217 | - | 794 |
| Participant Travel (Peso Trust Fund "A") | 113 | 97 | - | - | - | 210 |
| Operation and Maintenance BFAR | - | 709 | 1,300 | 1,455 | 1,500 | 4,964 |
| Construction of FFH-ETC | 8,855 | 8,763 | - | - | - | 17,618 |
| TOTAL GOP OBLITATIONS | 9,098 | 9,906 | 1,410 | 1,672 | 1,500 | 23,586 |

FFH-ETC ORGANIZATIONAL CHART



ANNEX F

Total fish (T. nilotica) harvested by month of
September 1, 1982, through August 31, 1983

| <u>Month</u> | <u>Number</u> | <u>Weight (kg)</u> |
|--------------|------------------|--------------------|
| September | 543,988 | 2,088.48 |
| October | 410,391 | 2,961.34 |
| November | 206,942 | 1,585.41 |
| December | 152,524 | 1,736.20 |
| January | 294,240 | 2,367.58 |
| February | 321,713 | 2,860.80 |
| March | 252,884 | 1,616.32 |
| April | 480,120 | 2,117.78 |
| May | 285,565 | 2,938.36 |
| June | 49,245 | 1,110.39 |
| July | 104,787 | 1,132.00 |
| August | <u>242,292</u> | <u>3,176.00</u> |
| TOTAL | <u>3,344,691</u> | <u>25,690.66</u> |

ANNEX G

EXTENSION VISITS MADE AND THE NUMBER OF COOPERATORS SERVED (JANUARY TO OCTOBER, 1983)

| TYPE OF OPERATION | NUMBER OF VISITS | NUMBER OF COOPERATORS SERVED | PICKED-UP | | DELIVERED FINGERLINGS | |
|-----------------------------|------------------|------------------------------|-----------------------|-----------|-----------------------|------------|
| | | | FINGERLINGS Purchased | Free | Purchased | Free |
| 1. Fishpond | 443 | 378 | 249 | 33 | 97 | 56 |
| 2. Rice-Fish | 141 | 111 | 19 | 14 | 8 | 12 |
| 3. Gabi-Fish | 18 | 15 | 2 | 2 | - | 1 |
| 4. Poultry/Fish | - | - | - | - | - | - |
| 5. Integrated | 2 | 2 | 1 | - | 1 | 1 |
| 6. Cages | 44 | 35 | 3 | 3 | 5 | 15 |
| 7. Barricade/Fishpen | 12 | 11 | 2 | 1 | 7 | 12 |
| 8. Freshwater Fish Hatchery | 86 | 66 | 11 | 2 | 6 | 9 |
| 9. Communal Water | 3 | - | - | - | - | 1 |
| 10. Research | 1 | 1 | 3 | 7 | 1 | 1 |
| 11. Livelihood | 3 | 3 | - | 5 | - | 1 |
| TOTAL | 753 | 622 | 290 | 67 | 120 | 109 |

ANNEX H

EXTENSION DEMONSTRATION PROJECTS OF FFH-ETC

| NAME OF COOPERATOR | LOCATION OF PROJECT | TYPE OF OPERATION | DATE OF STOCKING | No. of Stockings Made | No. of Fingerlings Stocked | Tentative Date of harvest and Remarks |
|-----------------------|--|-----------------------|------------------|-----------------------|----------------------------|---------------------------------------|
| <u>Nueva Ecija</u> | | | | | | |
| 1. Victor Agagne | Sto. Nino, San Jose City | Backyard fishpond | 12-27-82 | 1 | 3,000(13g) | *5-583 |
| 2. Luisito Concepcion | Sitio 213, Sto. Rosario, Sto. Domingo, Nueva Ecija | Backyard fishpond | 2-8-83 | 1 | 6,046(18.6g) | 6-15-83 |
| 3. Casimiro Dasalla | Sapang Kawayan, Munoz, Nueva Ecija | Rice-fish | 9-28-82 | 2 | 420 (3.2g) | *5-12-83 |
| | | | 9-15-83 | 1 | 1,100 (11.8g) | |
| 4. Fortunato Dayao | Soledad, Sta. Rosa, Nueva Ecija | Rice-fish | 2-17-83 | 1 | 2,173 (11-20g) | 6-10-83 |
| 5. Julie dela Cruz | Caalibangbangan, Cabanatuan City | Hatchery | 4-26-83 | 1 | 103 f/44 M(35g) | 5-11-83 |
| 6. Luisito de Luna | Marawa, Jaen, N. E. | Fishpond Rice-fish | 3-29-83 | 1 | 1,126(6-10g) | 6-30-83 |
| 7. Gregorio Tuazon | La Fuente, Sta. Rosa, Nueva Ecija | Barricade | 3-3-83 | 2 | 1,850(11-20g) | 1st week of July |
| | | | 3-9-83 | | 3,230 (13g) | |
| 8. Juan Jacob | Putlan, Carranglan, Nueva Ecija | Hatchery | 2-15-83 | 1 | 800 (11-8g) | 3-22-83 |
| 9. Elioterio Magaña | Puncan, Carranglan, | Rice-fish | 12-27-82 | 1 | 300 (13g) | 1st week of April |

*Assisted by Field Extension Team Representative during harvesting.

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| | | | | | | |
|-------------------------|--------------------------------------|-------------------------|-----------------------------|---|--|------------------|
| 10. Frisco Ramos | Pangatian, Cabanatuan City | Hatchery | 2-22-83 | 1 | 2,071(14g) | Last week |
| 11. Florentino Santiago | Paludpod, Talavera, Nueva Ecija | Rice-fish/ Gabi-fish | 3-23-83 | 1 | 1,830(7.1g) | 1st week of July |
| 12. Juanito Salazar | Bakal I, Talavera, Nueva Ecija | Fishpond | 2-8-83 | 1 | 600 (8.6g) | 2nd week of June |
| 13. Arthur Padero | Maligaya, Munoz, Nueva Ecija | Fishpond | 2-8-83 | 1 | 210 (8.6g) | 2nd week of June |
| 14. Katuiran Villaroman | Bagong Silang, Talavera, N. E. | Fishpond | 4-7-83 2-8-83 | 2 | 1,060(3g) 1,000(8.6g) | *5-9-83 |
| 15. Macario Salvador | Bagong Silang, Talavera, N. E. | Fishpond | 11-24-82 4-13-83 | 2 | 260(5-10g) 140 (8.6g) | *3-4-83 |
| 16. Zacarias Sanchez | Garan, Guimba, N.E. | Fishpond | 2-8-83 | 1 | 1,952(8.6g) | *5-14-83 |
| 17. Roberto Sayco | Sapang Kawayan, Munoz, Nueva Ecija | Rice-fish | 8-2-82 2-15-83 3-9-83 | 3 | 1,400 (31.5g) 1,100 (11.8g) 2,000 (1g) | *5-12-83 |
| 18. Bernardo Tolentino | San Isidro, Cabanatuan City | Fishpond | 2-21-83 | 1 | 10,303(1-6g) | Last week June |
| 19. Renato Venturina | Puncan, Carranglan, Nueva Ecija | Gabi-fish | 11-17-82 | 1 | 500(10g) | Last week March |
| 20. Federico Cuaresma | Galvan, Guimba, N.E. | Rice-fish | 3-9-83 | 1 | 2,666(3g) | Paddy dri up |
| 21. Arsenio Aquino | Sto. Rosario, Sto. Domingo, N. E. | Fishpond | 2-20-83 | 1 | 315(4.3g) | 1st week June |
| 22. Dalmacio Pablo | Bagong Silang, Talavera, Nueva Ecija | Fishpond | 3-29-83 | 1 | 6,675(1-5g) | Last week July |

| | | | | | | | |
|-----|---------------------|--------------------------------------|-----------|-------------------|---|-------------------------|--|
| 23. | Marcelino Carlos | Arimal, Lupao, N. E. | Rice-fish | 4-22-83 | 1 | 520(1-5g) | 1st week of August |
| 24. | Rolando Rovillos | Soledad, Sta, Rosa, <u>Tarlac</u> | Rice-fish | 9-27-83 | 1 | 1,250(.83g) | |
| 1. | Rosendo Gapay | Matayumtayum, La Paz Tarlac | Hatchery | 4-29-83 | 1 | 1,500 breeders | 6-13-83 |
| 2. | Pacifico Taroma | Anao, Tarlac | Fishpond | 1-6-83 | 1 | 9,000(11-20g) | *5-3-83 5-13-83 |
| 3. | Inocencio Ulfindo | Singat, Pura, Tarlac | Fishpond | 12-7-82 | 1 | 12,400(6-10g) | Pond dried up first transfer to adjacent Pond |
| 4. | Vitaliano Castaneda | San Luis, Tarlac, Tarlac | Rice-fish | 1-12-8 | 1 | 850(25g) | Last week April |
| 5. | Dothy Iganacio | Tibag, Tarlac, Tarlac | Fishpond | 3-10-83 | 1 | 3,311(2.2g) | 1st week of July |
| 6. | Aida Cuanco | Sta. Ignacio, Tarlac | Hatchery | 5-11-83 | 1 | 746 breeders | 6-25-83 |
| 7. | Pacifico Mendoza | Tibagan, Tarlac, Tarlac | Rice-fish | 2-26-83 3-4-83 | 2 | 2,248 (25g) 530 (8g) | *5-3-83 |
| 8. | Carlos Aquino | Dungan, Concepcion, Tarlac | Rice-fish | 9-14-83 | 1 | 798 (10g) | |
| 9. | Benjamin Mendoza | Salapungan, Gerona, Tarlac | Rice-fish | 9-28-83 | 1 | 4,545(.66g) | |
| 10. | Simplicio Balmores | Salapungan, Gerona, Tarlac | Rice-fish | 9-28-83 | 1 | 4,545(.66g) | |
| 11. | Diosdado Rodriguez | Parsolingan, Gerona Tarlac | Rice-fish | 8-9-83 | 1 | 2,075(6.6g) | |

| | | | | | | | |
|--------------------|---------------------|---------------------------------|------------------------|---------|---|--------------|----------------------|
| 12. | Vicente Tabuyo | Parsolingan, Gerona, Tarlac | Rice-fish | 8-9-83 | 1 | 303(6.6g) | |
| 13. | Antonio Ular | Parsolingan, Gerona, Tarlac | Rice-fish | 8-9-83 | 1 | 363(6.6g) | |
| 14. | Alfredo Salcedo | Parsolingan, Gerona, Tarlac | Rice-fish | 8-9-83 | 1 | 1,500(6.6g) | |
| 15. | Alfredo Salcedo | Parsolinga, Gerona, Tarlac | Rice-fish | 8-9-83 | 1 | 2,000(6.6g) | |
| 16. | Bonifacio Roque | Parsolingan, Gerona, Tarlac | Rice-fish | 8-9-83 | 1 | 878(6.6g) | |
| C. <u>Pampanga</u> | | | | | | | |
| 1. | Teodoro Regala | Sulipan, Apalit, Pampanga | Fishpond | 3-10-83 | 1 | 8,443(8-9g) | Last week o June |
| 2. | Benito Galang | San Miguel, Lubao, Pampanga | Barricade | 4-20-83 | 1 | 1,250(6-10g) | Midweek of July |
| 3. | Enrico Cruz | San Nicolas, Lubao, Pampanga | Barricade | 4-20-83 | 1 | 4,500(6-10g) | Midweek of July |
| D. <u>Bulacan</u> | | | | | | | |
| 1. | Regino Sanchez | Bustos, Bulacan | Rice-fish/ Fishpond | 1-11-83 | 1 | 1,925(11g) | Midweek of April |
| 2. | Estanislao Bautista | Malamig, Bustos, Bulacan | Rice-fish | 1-18-83 | 1 | 3,200(16g) | Last week o April |
| 3. | Maximino Cruz | Sto Nino, Hagonoy, Bulacan | Fishpond | 5-20-83 | 1 | 6,000(1g) | Midweek of Sept. |

| | | | | | | | | |
|----------------------|------------------|--------------------------------------|-----------------------|--------------------|---|---------------------|-----------------------|--|
| 4. | Edmundo Reyes | San Jose, Bulacan | Fishpond | | | | | |
| 5. | Eliño Santos | San Miguel, Calumpit, Bulacan | Fishpond | 4-19-83 | 1 | 5,300(1-5g) | 1st week of August | |
| E. <u>Bataan</u> | | | | | | | | |
| 1. | Roger Morales | Hermosa, Bataan | Rice/fish fishpond | 2-11-83 | 1 | 1,261(16.6g) | 1st week of June | |
| 2. | Marioano Morales | Hermosa, Bataan | Rice-fish | 2-11-83 | 1 | 443(16.6g) | 1st week of June | |
| 3. | Ariel Salas | Hermosa, Bataan | Fishpond | 2-11-83 | 1 | 1,549(16.6g) | 1st week of June | |
| F. <u>Zambales</u> | | | | | | | | |
| 1. | Ernesto Eviota | Yamot, Candelaria, Zambales | Fishpond | 2-3-83 | 1 | 764(17.6g) | 1st week of June | |
| G. <u>Pangasinan</u> | | | | | | | | |
| 1. | Nesto Villafania | Maynien, Sta. Barbara, Pangasinan | Rice-fish | 12-15-82 2-8-83 | 2 | 150(20g) 399(8g) | *5-6-83 | |

TRAINING PROGRAMS AND OTHER ACTIVITIES CONDUCTED AT THE FFH-ETC (MARCH TO OCTOBER, 1983)

| TITLE | DURATION | PARTICIPANTS |
|---|--|--|
| 1. Leadership Management Seminar | : March 15 - 17 | : 31 FFH-ETC Technical & Support Staff |
| 2. Field Day for Small-Scale Fish-farmers of Central Luzon | : April 21 | : 33 Fishfarmers |
| 3. Peace Corps Volunteers' Training for Freshwater Fisheries Volunteer | : April 24 - 30 | : 3 Peace Corps Volunteer |
| 4. On-the-Job-Training for CLSU Fisheries Students | : April 15 - May 20 | : 12 CLSU Students |
| 5. Training on Tilapia Production for KKK Fishfarmers | : May 9 - 20 | : 5 Fishfarmers |
| 6. Orientation and Familiarization on Freshwater Fish Hatchery Management | : | : 1 Nigerian |
| 7. Field Day for Small-Scale Fish Farmers of Talavera, Nueva Ecija | : June 29 | : 27 Fishfarmers |
| 8. Basic Fish Culture Course Extension Methodology | : August 21 - September 1 : August 30 - September 1 | : 21 BFAR Technicians : 20 BFAR Technicians |
| 9. Training on Tilapia Hatchery Management | : September 29 - October 1 | : 11 ICLARM Cooperators |
| 10. On-the-Job-Training for Fishpond Caretaker | : September 30 - October 11 | : 7 Fishpond Caretakers |
| 11. Observation/Study Tour | : October 24-28 | : 1 Indonesian |

ANNEX J

FINGERLING DISTRIBUTION SUMMARY REPORT FROM THE MONTH OF JANUARY TO OCTOBER, 1983

| MONTH | NO. OF COOPERATORS SERVED | | | TOTAL | Q U A N T I T Y | | | TOTAL | : COST OF SOLD FISH |
|------------------|---------------------------|------------|--|------------|------------------|----------------|----------|------------------|---------------------|
| | SOLD | FREE | | | SOLD | FREE | | | |
| January | 32 | 11 | | 43 | 160,237 F | 61,723 F | | 255,266 | ₱ 13,386.60 |
| February | 43 | 41 | | 84 | 128,743 F | 87,366 F | 3,306 B | | |
| March | 45 | 26 | | 71 | 209,248 F | 107,465 F | 768 B | 217,077 | 12,738.91 |
| April | 40 | 26 | | 66 | 182,351 F | 193,005 F | 14,540 B | 334,022 | 17,705.70 |
| May | 37 | 8 | | 45 | 185,112 F | 29,869 F | 22,290 B | 419,295 | 24,405.50 |
| June | 31 | 3 | | 34 | 58,152 F | 21,275 F | 9,049 B | 225,190 | 15,535.79 |
| July | 26 | 7 | | 33 | 122,241 F | 21,739 F | 2,610 B | 92,474 | 13,589.60 |
| August | 54 | 16 | | 70 | 249,865 F | 57,857 F | 10,753 B | 161,936 | 16,751.00 |
| September | 51 | 22 | | 73 | 110,711 F | 91,252 F | 2,786 B | 315,868 | 26,037.50 |
| October | 53 | 18 | | 71 | 121,480 F | 242,431 F | 320 B | 202,482 | 13,133.00 |
| | | | | | 651 B | 20 B | | | |
| T O T A L | 412 | 178 | | 590 | 1,577,769 | 980,424 | | 2,558,193 | ₱167,161.06 |

Legend:

F - Fingerlings
B - Breeders

TECHNICAL MANUSCRIPTS PRODUCED BY THE FFH-ETC

1. Guidelines for Profitable Tilapia Production in Central Luzon.
2. Hatchery Pond Management
3. Tilapia Cage Culture
4. Tilapia Production Schemes
5. Site Selection
6. Types of Ponds
7. Pond Construction
8. Some Pointers on Fish Distribution and Transportation
9. Procedures for Fish Distribution of the FFH-ETC
10. Guidelines for Fish Distribution in the FFH-ETC
11. Fish Diet Formulation
12. Evaluation of Hatchery Management schemes for Large Scale Production of Oreochromis niloticus fingerlings in Central Luzon, Philippines
13. Basic Guidelines of Extension
14. A Survey of Extension Concepts and Delivery Systems
15. Pond Fish Demonstration
16. Developing Extension and Freshwater Fish Delivery Systems for the FFH-ETC
17. Rice-Fish Culture
18. Transfer of Fish Culture Technology in Central Luzon, Philippines
19. Notes Relating to Extension Personnel.