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**THE VILLAGE FISHPOND DEVELOPMENT PROJECT
IN THAILAND (# 493-0303)
1979 - 1981**

**Report of the Project Evaluation
Conducted by
A Joint Thai/American Evaluation Team**

For USAID/Bangkok

June 1981

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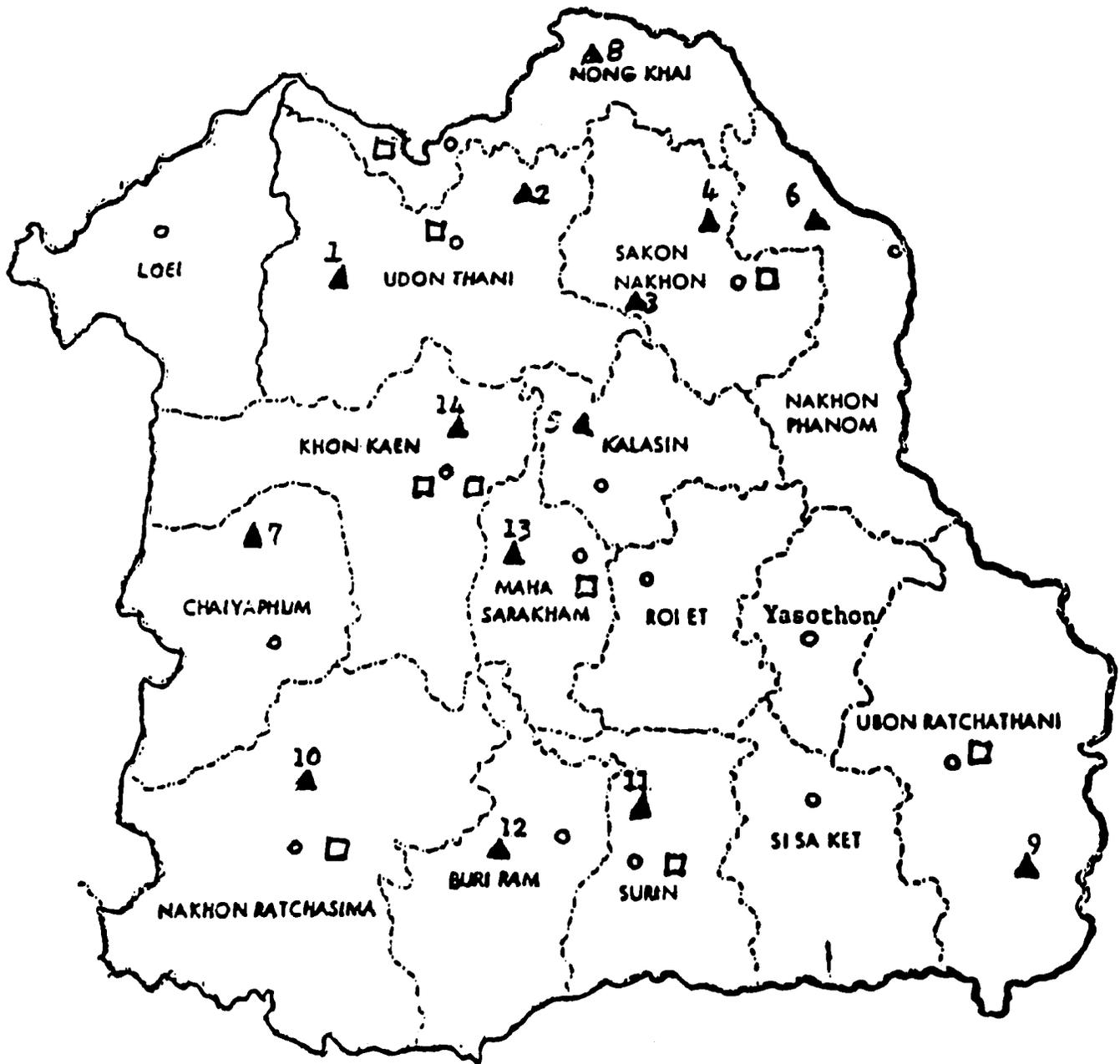
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Throughout this entire assignment, and particularly in the preparation of the draft and final reports, Ms Beth Jackson has provided invaluable assistance to the evaluation team which is greatly appreciated. Also Ms Joy Lester did an excellent job of typing the report within a tight time schedule and the evaluation team wishes to thank her for this important contribution.

CHANGWATS (PROVINCES) IN THE NORTHEAST REGION
OF THAILAND



- ◻ Existing Fishery Stations
- ▲ Village Fish Pond Locations

ABBREVIATIONS, TERMS AND EQUIVALENTS

ADB	-	Asian Development Bank
AIT	-	Asian Institute of Technology
ARD	-	Accelerated Rural Development Office
BOB	-	Bureau of the Budget
CUSRI	-	Chulalongkorn University Social Research Institute
DCD	-	Department of Community Development
DLD	-	Department of Land Development
DOAE	-	Department of Agricultural Extension
DOF	-	Department of Fisheries
DTEC	-	Department of Technical and Economic Cooperation
FAO	-	Food and Agriculture Organization of the U.N.
FFD	-	Freshwater Fishery Division
FFS	-	Freshwater Fishery Station
MOAC	-	Ministry of Agriculture and Cooperatives
NERAD	-	Northeast Rainfed Agricultural Development Project
NESDB	-	National Economic and Social Development Board
NIFI	-	National Inland Fisheries Institute
PFO	-	Provincial Fishery Office
PID	-	Project Identification Document
PP	-	Project Paper
RID	-	Royal Irrigation Department
RTG	-	Royal Thai Government
UNDP	-	United Nations Development Program
USAID	-	U.S. Agency for International Development
VFP	-	Village Fishpond Development Project

AREA EQUIVALENTS

1 rai = 0.16 hectares (40x40 meters)

1 hectare (ha.) = 6.25 rai

CURRENCY EQUIVALENTS

U.S. \$1.00 = Baht (฿) 20.00

Baht (฿) 1.00 = U.S. \$0.05

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I. EXECUTIVE SUMMARY

A. Major Findings and Recommendations

1. Background

Lack of water for domestic use, fish production and agriculture is one of the most serious constraints to economic development in the Northeast. To address this problem, the Department of Fisheries (DOF) in recent years has provided assistance for the development of village fishponds, and for fish production and multiple-purpose pond management systems in the needy rural areas. The USAID-assisted Village Fishpond Development Project (VFP), a two-year pilot project begun in October 1979 and scheduled to finish in December 1981, is a further attempt to develop pond construction methods, fish production techniques and multiple-use management systems that can be replicated in villages throughout the Northeast.

The VFP is financing the construction of 14 village fishponds in 12 provinces representing a cross-section of Northeast Thailand. The overall goal is to improve the nutrition and quality of life of the villagers in these rural communities. The major planned outputs of the project include the establishment by DOF of village ponds, construction by the villagers of nursery ponds for fingerling production, and development of integrated pond management systems. The VFP puts particular emphasis on the critical link between the government and the villagers, the DOF Site Teams, as the means to transfer knowledge about fish raising methods, fingerling production and multiple-uses of the ponds. At each location, a village committee, assisted by a Site Team, is to be the primary action group for management and maintenance of the pond. The ultimate aim is to assist the village committees to become self-reliant in deriving the maximum social and economic benefits from the pond. To this end, the project provides for special training of the Site Teams as well as training of the village committee members in all aspects of pond management.

2. Major Conclusions

In comparing the VFP targets and accomplishments to date, the evaluation team found that in broad economic and social terms the VFP is having less impact than was anticipated, due, in part, to the fact that the project was over-designed and lacked strong management. Welfare of the villagers, as indicated by increased incomes from greater production and sale of fish, garden and orchard crops, live-stock and surplus rice has not improved significantly as a result of the VFP. Fish production levels in the few ponds harvested are estimated to be about 5 kgs of fish per person, compared to the project target of 10 kgs per person. This could have been substantially increased if the project had provided more adequate pond design and construction, better management, and introduction of improved fish production techniques at the village level.

The social impact of the project is mixed to date. In some villages a very positive feeling has developed regarding the pond. Here, the people perceive the pond as their own and take an active interest in its management for fish production and multiple uses. In these cases, a significant impact of the pond on village life can be predicted. In other project villages, however, such a positive attitude does not appear to be developing, and neither the planned social nor economic benefits of the project are being fully realized.

3. Considerations for the Future

In spite of the problems encountered in the implementation of the VFP, the evaluation team believes the human and natural resources exist both in the DOF and in the villages for an effective village fishpond development effort. Valuable lessons have been learned from this project which can serve as guidance in designing and implementing a follow-on project. In particular, the VFP has shown the critical need for a workable project design and a structured project management system from DOF headquarters to the field level if a project of this type is to be successful.

Many of the recommendations included in this evaluation will be applicable to the DOF's 5-year fisheries development program as well as to a USAID-assisted part of this national plan. Also, section VI-B contains specific suggestions for the DOF/RTG and USAID to consider in planning such a project.

4. Major Recommendations Related to USAID Assistance

(a) Assistance to the VFP-I should be allowed to end as scheduled in December 1981.

(b) Within the remaining time, DOF and USAID should collaborate to prepare a suitable USAID-assisted follow-on fisheries development project. If agreement can be reached on a suitable set of objectives and the implementation strategy, USAID and the DOF should provide a joint Thai/U.S. team for up to three months to prepare a detailed Project Paper. (Suggestions for the make-up of the design team and for a USAID-assisted follow-on project are included in part VI-B of this report.)

(c) The DOF and USAID should reach agreement on the suitability of using unexpended project funds for selected training, commodities for Provincial Fisheries Stations and project village sites as well as for socio-economic studies, seminars, etc. Major focus should be on use of these funds to strengthen the existing project management capability leading to a generally improved ability to design and implement a follow-on project. (Suggestions for use of the unexpended funds are included in the recommendations for a follow-on project as well as in Appendix J.)

B. Project Identification Facesheet

1. Country: Thailand
2. Bilateral Project Title: Village Fishpond Development Project (VFP-I)
3. Bilateral Project Number: 493-0303
4. Program Implementation:
 - (a) First Project Agreement: September 26, 1979
 - (b) Project Assistance Completion Date: December 31, 1981
5. Program Funding:
 - (a) A.I.D. Bilateral Funding \$442,000 (Grant, FY 80)
 - (b) Host Country Counterpart Funding \$287,000
6. Mode of Implementation:
 - (a) Project Agreement between USAID/Thailand and Thailand Department of Technical and Economic Cooperation (DTEC)
 - (b) Project Implementation Letters Nos. 1-8
7. Previous Evaluations and Reviews:
 - (a) "Report on the Preliminary Survey on Social Aspects of Northeastern Villages in Thailand for the Fishpond Development Project", by Chaleo Roongrujipimon, Prapee Makaranond and Matrini Nathalang, Faculty of Social Sciences, Kasatesart University, May 1979
 - (b) "Pre-appraisal/Design Study, VFP I and II", by H.R. Schmittou and M. Cremer, Auburn University, November 1980
8. Responsible Mission Officials:
 - (a) Mission Directors: Charles Gladson, 1976 to 1978; Donald Cohen, 1978 to present
 - (b) Mission Deputy Director: Robert Queener, 1979 to present
 - (c) Project Officers: Wayne Slotten, 1975 to 1980; Robert Resseque, 1980 to present
 - (d) Program Specialists: Uoychai Vattraphoudej, 1979 to 1980; Det Trisahd, 1980 to present
9. Host Country Currency:
 - (a) Name of currency: Baht
 - (b) Exchange Rate at Time of Project: 20 Baht = US\$1

II. CONCLUSIONS AND RECOMMENDATIONS

A. Introduction

Essentially the VFP has resulted in the construction of the planned 14 village ponds. The Provincial Fisheries Stations have stocked most of the ponds and others, recently completed, will be stocked in the coming months. Because of the over-ambitious project design, delayed implementation, the extensive fish production technology applied, as well as management, pond design and construction problems, the VFP is having less social and economic impact in the target villages than was anticipated in the Project Paper. The capability of the villagers to manage the ponds for high, sustainable yields of fish or for effective multiple-use purposes is not well developed at this time.

B. Conclusions

1. Appropriateness of Pond Site Selection, Design and Construction

(a) Rainfall and other water drained from the watershed areas is sufficient to fill the VFP ponds. The water-holding capacities of all project fishponds visited, under present conditions, should be adequate for multiple-uses of water both in the wet-season and dry-season provided that the water resource is effectively managed by the village committee.

(b) The expected environmental changes resulting from new water impoundments should be the reduction of aquatic vegetation growth, the increase of siltation or sedimentation in the pond, the increase of potential ground water recharge and thus the increase of ground water levels and recharge rate of wells in the vicinity of the ponds.

(c) Construction in the VFP was generally not satisfactory due to many problems encountered during site selection, design and construction supervision. However, these problems can be reduced in the future if timely provision of appropriate personnel and funds by the concerned agencies are adequate and there is good coordination between these agencies.

(d) The least cost for any ponds to be constructed in the future should be carefully considered. Smaller and deeper dug-out ponds might be more easily managed for fish production and other purposes in the Northeast and might be constructed at a lower unit cost.

(e) The engineering capability of DOF to provide timely and adequate supervision of pond construction and to rehabilitate existing ponds is low at present. For similar works in the future, the DOF cannot provide adequate engineering personnel and, thus, needs other government agencies and the private sector to assist in all phases of future pond construction.

(f) Private contractors are highly interested in any future fishpond project. The numbers and capabilities of the contractors are adequate to assist in the construction work. However, in some provinces, only a few local private companies have the required equipment and engineering capabilities. Therefore, it is suggested that private contractors in Bangkok and big cities of the Northeast should be selected as the contractors for provinces where the available companies are inadequate.

2. Fish Production Technology

(a) By design the Village Fishpond Project (VFP) is a multi-purpose integrated rural development project based on small-scale water resources development, with fish production development as its major component. The project is both appropriate and workable for a long range rural development program in the arid Northeast as it is based on a critical need of the villagers for dry-season water. However, the fish production plan proposed by the project is over-designed and unrealistic in that it requires more infrastructure, technology, production inputs and management capability than the present project has been designed for, or is capable of delivering.

(b) In implementation, the project has been confronted with a number of constraints that have limited its success. In particular, there have been major constraints in reference to project management and pond construction. Other unplanned constraints have included a lack of fertilizer (manure) for production support, and the villagers' preference for maintaining and managing the pond water for their first priority: domestic use (which has resulted, for example, in the villagers' unwillingness to add manure to the ponds and their self-imposed restrictions on fish harvests or use of the ponds for watering livestock).

(c) With the existing limited use of fertilizer and feeds, production has been less than 80 kgs/rai/year (500 kgs/ha/year). (The PP projected 240-344 kg/rai/yr - 1500-2150 kgs/ha/yr.) Likewise, none of the villages have become, or are likely to become, self-sufficient in the production of fingerlings by the end of the project due to various delays, including delayed release of funds for Site Team training by the Bureau of the Budget (BOB). As a result, it appears the project will have very little impact on the project goal of improving nutrition and income through the production of fish.

3. Management Considerations and Economic Benefits

(a) Though village committees have been named for all ponds, their capabilities to manage the ponds for maximum fish production and optimum multiple-purpose uses are not well developed in most villages, in part due to delayed release of funds for Site Team training from the BOB.

(b) Benefits realized from VFP-I consist mainly of returns from fish production, domestic water and some garden-orchard crops. Judging from the fish production from the two harvested ponds where data was available, in comparison with the production models, there is significant room for improvement in terms of fish production.

(c) Given the present situation, priority should be given to small size ponds where more effective operations are possible. Production with village nursery ponds, though more profitable in the models (described in section V-D), has been postponed until better local management capabilities are developed. Attempts should be made to gear the fish production management system from one not including supplemental feed to one which includes such feed in order to get greater benefits.

4. Social Considerations and Benefits

(a) Northeast villagers are familiar with fishing and try, whenever possible, to supplement their diet with fish caught in natural waters near the village.

(b) In general, the VFP has had only a limited effect on improving the nutrition levels in the project villages. To some extent this is because the project has been in full operation for only about one year and because of the social considerations regarding villagers' food preferences.

(c) In terms of use of the ponds for irrigated production of gardens or orchards, as well as other uses, the villagers of the Northeast are not yet experienced in multiple-purpose uses of such ponds and will need substantial assistance to learn how to use the ponds effectively for maximum social and economic benefits.

C. Recommendations

1. Pond Site Selection, Design and Construction

(a) Pond site selection and development activities should be more effectively managed by the concerned agencies, especially DCF and provincial governments, as well as the village committees.

(b) If possible, the construction of nursery ponds (and other works which are needed immediately after the construction of the embankment and spillways such as sodding and dredging) should be included by the DOF in the construction contract so that the ponds could be effectively constructed and the useful life of each pond would be extended without more frequent maintenance.

(c) The private sector companies should be carefully selected by DOF to assist in all aspects of the construction in the future as the capability of DOF in construction is not adequate. Although more funds are needed for the contracted works, the results would be acceptable with respect to the quality of the construction work.

2. Fish Production Technology

(a) The DOF and USAID should design projects of this type to be extensive, low-management fish production systems and use a simple method such as the stocking of species that will reproduce naturally and will require the least management ability to allow the villages to become self-sufficient.

(b) DOF and USAID should expand the village fishpond concept so as to view the function of the main pond as a facility to produce food fish (at the extensive level) and fingerlings to backstop the nursery pond operation, which in turn would supply fingerlings to stock rice fields or rice-paddy ponds instead of for restocking the main pond. (Some species will establish a reproducing population that will restock the main pond, without management inputs required.)

(c) The DOF should develop standards for the construction of ponds that take into consideration the requirements for fish production.

(d) The DOF should establish teams (at regional or provincial levels) of pond construction specialists to design and monitor DOF pond construction activities.

(e) The DOF, with assistance from one or more RTG agencies having expertise in pond construction, should re-survey all fourteen of the existing VFP sites to evaluate the feasibility and cost for renovation or modification of the ponds, in reference to deepening ponds and levelling bottoms for improving water storage and fish production potential.

(f) The DOF should reduce stocking rates in all village ponds relative to inputs available. Present stocking rates of 2200 to 7000 fingerlings/rai (13,750-43,750/ha) greatly exceed that recommended for the level of nutrient inputs (fertilization rates). In addition, larger fish should be stocked to improve survival rates.

(g) Where DOF desires to achieve higher fish production levels, it should formulate methods and mechanisms for expanding the use of inorganic (NPK) fertilizer. DOF assistance in establishing a source of fertilizer credit and control over the quality, quantity and price of fertilizer inputs for VFP villages will also become essential due to RTG's balance of payments and needs for fertilizer in other agricultural areas.

(h) DOF should periodically evaluate the actual cost of producing fingerlings, to help establish and maintain prices that are fair to both the producer and farmer.

(i) DOF should examine its organizational and management structure in order to determine if improvements can be made in its capability to provide an adequate level of support to the VFP or any follow-on projects.

(j) A project reporting system should be established by the DOF to provide a regular flow of information from the VFP villages to be used by the Project Manager for more effective project implementation. Some suggestions for such a reporting system are included in part V-C of this report.

(k) USAID and DOF should utilize remaining project funds to establish demonstration sites at the Sai Ngam, Fai Mai, Nong Pling and Nong Pluai villages, and to transport village representatives from other VFP villages to observe the results. (See Appendix J for further details.)

3. Management and Economic Considerations

(a) DOF should properly train Site Teams, and ensure they are available to make frequent, short visits to the VFP villages, to assist villagers to manage the pond for maximum economic benefits.

(b) DOF should restructure the project with greater emphasis on management to increase the economic returns of this or a future project.

(c) Given the present situation, DOF should give priority to small size ponds where more effective operations are possible.

(d) In addition to fisheries technical training, the DOF and USAID should consider the suitability of providing project management training for selected senior and mid-level DOF officers at in-country institutions or short-courses.

(e) In projects of this type, the DOF and USAID should strengthen their management teamwork to avoid long delays in meeting conditions precedent, and in on-going monitoring of the project. Wherever necessary, outside technical or other short-term specialist assistance should be provided by USAID and/or the DOF.

4. Social Considerations

(a) In order to create a sense of belonging, the DOF and other agencies, starting with site selection, should plan the project in full consultation with the villagers themselves. Engineers, fishery biologists, and other government technicians should give the villagers recommendations but truly consider the needs and desires of the villagers throughout the entire planning and implementation process.

(b) The DOF Project Manager should ensure that the village fishpond committee is selected with regard to the required fishpond management activities. For example, the committee should consider the need for a manager, administrator or accountant, a person to settle conflicts, an organizer and a farm technologist. The committee should consist of a group of competent persons who can perform the above activities successfully.

(c) The DOF should ensure that the VFP committees are trained (as well as the Site Teams) with emphasis on community and self-development and integrated farm technology. A 5-day training course for the village committees in collaboration with the regional universities is recommended.

(d) The overall concept of the project must be understood by and demonstrated to the villagers and the DOF officers by senior DOF officials before implementation.

(e) The socio-economic studies to be conducted by the Chulalongkorn University Social Research Institute (CUSRI) should focus on management and social issues that have direct application to the remainder of the VFP-I and to the DOF 5-year plan and any future USAID-assisted project. (See details in Appendix L.)

5. Reccmmendations Related to USAID Assistance

(a) Assistance to the VFP-I should be allowed to end as presently scheduled in December 1981.

(b) Within the remaining time, DOF and USAID should collaborate to prepare a suitable follow-on fisheries development program. If agreement can be reached on a suitable set of objectives and the implementation strategy, USAID and DOF should provide a joint Thai/U.S. team for up to three months to prepare a detailed Project Paper. (Suggestions for the make-up of the design team and for a follow-on project are included in part VI-B of this report.)

(c) The DOF and USAID should reach agreement on the suitability of using unexpended project funds for selected training, commodities for Provincial Fisheries Stations and project village sites as well as for socio-economic studies, seminars, etc. Major focus should be on use of these funds to strengthen the existing project management capability leading to a generally improved ability to design and implement a follow-on project. (Suggestions for use of the unexpended funds are included in the recommendations for a follow-on project as well as in Appendix J.)

III. THE THAILAND CONTEXT^{1/}

A. National Economic Growth and Equity

According to the World Bank Country Study of Thailand, (1980), Thailand has experienced rapid growth in the past two decades. Recent Gross Domestic Product (GDP) growth has averaged over 7% per year; all sectors of the economy are participating in the growth, though the increase in agriculture of about 5% per year, mainly from the expansion of cultivated lands in the upland areas, is well below the 8% annual real growth in industry, and 7% growth for services. A rising rate of inflation; 2% annually before 1975 but up to almost 20% in 1980 due to rising petroleum prices, higher import costs and higher agricultural prices after two drought years, is eating away at the real amount of Thailand's economic growth.

Even with a relatively rapid population growth, per capita income has grown at a rate of 4% annually over the past decade. The majority of the country's population has benefitted from the recent growth, but the degree and nature of the benefits differ significantly among the four regions of the country and among the different population groups, and the relative inequality of income distribution is increasing in the country.

The RTG, in recognition of the disparity of incomes throughout the country, has recently identified some 250 of the poorest districts to receive special attention and developmental assistance starting in FY 82. A group of about 16 social and economic assistance projects have been selected for implementation in these poorer districts. One of these projects is the village fishpond program which is meant to be based upon experience gained in the present USAID-supported VFP-I. This RTG expansion of the village fishpond concept is a 5-year, approximately 75.5 million project that calls for construction of 375 new fish ponds and the rehabilitation of some 600 additional village ponds.

B. Economic Conditions in the Northeast

In the Northeast, most farmers have been unable to move out of a basically subsistence way of life, primarily because of their minimal education, poor soils, very uncertain weather conditions and lack of infrastructure in the area. In addition, they have received very little attention or encouragement from the central government until recently. One can safely say that the people of the Northeast have benefitted least from the past two decades of economic growth, and are now among the poorest people in Thailand.

1/ Adapted from various Mission documents as well as: "Thailand, Toward a Development Strategy of Full Participation", a World Bank Country Study, March 1980; and "Water for the Northeast: A Strategy for the Development of Small-Scale Water Resources", Asian Institute of Technology, 1978. See also Appendix G, Literature Reviewed.

While the proportion of the country's total population living in absolute poverty (defined as \$150/month/person) has declined from about half in the early 1960s to a quarter in recent years, still 11 million people in Thailand remain in this category. Approximately half of this poverty group lives in Northeast Thailand. Thirty-five percent of Thailand's population live in the Northeast, but they only produce 15% of the GDP.

C. Development Constraints in the Northeast

Lack of adequate water for agricultural use is considered the most serious constraint to improving the economic conditions and quality of life of the small farmers in the Northeast. An estimated 80% of the rural population in Northeast Thailand does not have access to dependable water supplies throughout the dry season, extending from about November through May. Thus, for some 16,000 villagers, adequate water is available only during the rainy season or as available from small, local water impoundments. Insufficient water has resulted in a low input and low return rainfed agriculture, based mainly on single cropping of the local glutinous rice varieties.

In addition, the remoteness of most of the rural population from large reservoirs and dependable, year-round rivers limits the production of fish, a traditional and important protein source in Thailand. In the Northeast, for example, nutrition specialists estimate that annual fish consumption is about 10 kgs less per person than the national average of about 21 kgs per person.

D. Development Potential in the Northeast

Provision of improved water resources is fundamental to general economic development and social stabilization of Northeast Thailand. Year-round access to dependable sources of water for domestic use, fish production, livestock watering and supplemental rainy-season irrigation or dry season horticultural crop production is needed. According to the Asian Institute for Technology (AIT) study, the best way to meet these requirements for water in the Northeast is by means of small water development projects; particularly small to medium size ponds. Such ponds can be constructed at many locations at relatively low cost. They offer excellent potential for development of multiple-use practices which can, if properly supported and managed, meet the most important needs of the villagers.

IV. THE VILLAGE FISHPOND DEVELOPMENT PROGRAM

A. Historical Perspective

The Freshwater Fisheries Division (FFD) of the Department of Fisheries (DOF) has been interested in village fishponds as far back as 1969. Apparently, however, the FFD has not previously launched a major effort to build large numbers of such ponds nor to promote widespread development of pond management skills in the rural communities where there are existing or new ponds. Basically, funds for construction of ponds have been lacking, as have fingerlings for stocking on a large scale. Average fish yields from existing ponds have been below 80 kg/rai/yr (500 kg/ha/yr). Shortages of inputs and inadequate fish production extension activities to teach villagers more effective fish production techniques and pond management are listed as the main reasons for the shortcomings of village fishponds in the past.

In an attempt to improve village fishpond production levels and begin to gather, on a pilot basis, data that would be useful for a more concentrated assistance effort, two ponds were built as part of a joint Thai-Canadian project; one in the Northeast (Kalasin Province) and the second in the South (Narathiwat Province). These ponds were completed in September 1977 and were filled and stocked at that time. In late 1978 the Asian Development Bank (ADB) provided a U.S.\$14 million loan to the RTG for aquaculture development in South and Central Thailand. One component of the ADB-assisted program was an integrated, multiple-purpose pond project in Central Thailand. The UNDP/FAO is providing grant assistance to the National Inland Fisheries Institute (NIFI) in research and development of improved aquaculture techniques, including disease control methods and fish pond management. Support for a demonstration fish farm complex to be used for applied research and training of extension workers was to be an important part of this project.

B. Village Fishpond Development Project I (VFP-I)

The VFP-I was designed to be based upon experience gained in the Thai-Canadian pilot fishpond development project. Such experience has been limited, however, because the Canadian Government was unable to continue its assistance to the pilot project. Like this previous project, the VFP-I is attempting, on a somewhat larger pilot model scale, to address the basic needs for water and fish protein of the rural poor.

The project is financing the construction or upgrading of a minimum of 14 ponds located in 12 provinces representing a cross-section of Northeast Thailand. Because of the relatively small number of villages thus receiving assistance, particular emphasis in the VFP-I was to be on development and testing of various management approaches that could be replicated throughout the Northeast.

The goal of this project is to contribute to the nutrition and quality of life in disadvantaged rural communities of Northeast Thailand. The basic premise is that small, community operated, dry-season water storage ponds, if managed effectively for optimal fish production and other water needs of the villagers, can help improve nutrition and provide additional opportunities to improve the villagers' incomes.

The purpose of the VFP-I is to provide selected rural communities in the Northeast with year-round access to supplemental water supplies and fish protein through techniques which can be replicated in the Northeast. A major assumption of the VFP is that the villagers themselves will be willing to manage the pond for the stated purposes and, if willing, will be capable of learning and applying the necessary management techniques to maximize pond benefits. Another important assumption is that the DOF and other Ministry of Agriculture staff at headquarters and field locations will provide the support, in terms of fingerlings, technical guidance and general extension assistance, necessary to develop the skills and capabilities of the villagers to effectively manage the pond water resource.

The major outputs linked to the project purpose are the establishment of community ponds, nursery ponds for fingerling production and an integrated system of multiple water uses at each sub-project location. Villagers are to be trained in appropriate pond management practices and fingerlings are to be produced by the Provincial Fisheries Stations as well as, eventually, by the villagers themselves.

The fish production component of the project is designed to include a stocking and harvesting system adapted to each particular pond. Fish yields are expected to range from less than 240 to 344 kgs/rai/annual cycle (1500 to 2150 kgs/ha/year). The project also calls for a plan to be developed for use of the pond water at each location so that target yields of fish will be produced while allowing for other uses of the stored water. These plans, prepared by the provincial DOF staff and the villagers themselves, are to include a program for maintenance and environmental management of the ponds.

C. Village Fishpond Development Project II (VFP-II)

A Project Identification Document (PID) was presented for the Village Fishpond Development Project II (VFP-II), proposed for FY 1981, on September 15, 1979, about the same time as the Project Agreement for VFP-I was signed. Clearly the implication all along has been that the VFP-I was a prelude to a follow-on project. This understanding on the part of RTG and USAID officials underscores the importance of the VFP-I as a pilot demonstration model which could provide the experience and data necessary to design and implement an effective follow-on project.

According to the PID, VFP-II is proposed as a five-year, U.S.\$10 million (loan and grant) project with emphasis on making water available in an additional 200 villages in Northeast Thailand. It would also plan to increase the DOF's institutional capability to promote more productive use of ponds for multiple-purpose uses as well as establish a strong community-based pond management system.

The VFP-II is seen as being complementary to another USAID-supported project, the Northeast Rainfed Agricultural Development Project (NERAD), which involves assistance to improve all aspects of the basic farming systems used by the farmers in the rainfed, non-irrigated areas of the Northeast. The VFP-II is expected to help create a favorable environment for NERAD's attempts to transform the basic economic condition of the farmers in the rainfed areas from one of subsistence to improved and sustained economic growth.

The VFP-II has not moved beyond the project planning stage to date due to a number of reasons. First, delays and incomplete achievements of VFP-I targets, as outlined in this evaluation report, prevented a full assessment of the VFP-I as a reliable model to be used in replicating the approaches and methods of the earlier project in the follow-on project. Also, the "Report of the Pre-Appraisal/Design Study" conducted by a two-man team from Auburn University in October-November 1980, raised some serious doubts about the suitability of the design for the VFP-II. In addition, the RTG, and in particular the DOF, has not been completely clear on the scope and specific methods and content of a follow-on project to VFP-I, particularly now that a nationally-supported, five-year village pond program has been approved for implementation starting in late 1981.

One of the main objectives of the present evaluation, therefore, is to attempt to set forth some clear recommendations regarding a possible follow-on project to VFP-I. These are presented in section VI of this report.

V. DISCUSSION OF FINDINGS, CONCLUSIONS
AND RECOMMENDATIONS

A. Major Findings and Overall Impact of the Project

1. Discussion of Findings

In broad economic terms the VFP is having less impact in the project villages than anticipated. Welfare of the villagers, as indicated by increased incomes resulting from greater production and sale of fish, garden and orchard crops, livestock and surplus rice (Project Paper, page 9), has not improved significantly to date as a result of the VFP. Certainly fish raised in the ponds can be an important contribution to the nutrition of the villagers, and at the ponds where fish have been harvested an estimated 5 kg of fish per person was produced. Such an increase in fish protein is an important contribution to the diet of a given family on a given day. However, the extensive fish culture method used at the present is not likely to produce at many of the project ponds the continual quantities of fish that would have an important, lasting effect on village nutrition or incomes.

The project foresaw an increase in productive use of marginal land around the ponds. While some of the villages (for example, Nong Pling) are using the ponds for dry-season irrigation of garden crops, this use has been limited to a small percentage of the people in the project villages. There is little evidence of an actively encouraged or managed program to use the ponds as a source of water for dry-season cropping or earlier planting of rice seedbeds envisioned in the project documents. (See VFP Output Matrix, Appendix F.) The project has not increased the use of pond water for growing orchard crops, either; the team observed no recently planted orchards in the vicinity of the ten ponds visited. In fact, in several locations, because of faulty design or construction techniques, some otherwise potentially productive areas on the perimeter of the ponds have become unuseable due to flooding (Non Dern) or removal of topsoil during construction (Nong Fai Mai and Nong Phran Pan).

The social impact of the VFP has been mixed to date. In some villages (for example, Sai Ngam), because of strong village leadership and appropriate site selection, pond design and construction, a very positive feeling has developed regarding the pond. In these villages the people were involved in the project from the start and thus perceive the pond as their own and take an active interest in its management for production of fish and for other purposes. Here a lasting and significant social (as well as economic) impact can be predicted. In a number of the other project villages, however, such a positive attitude toward the pond does not appear to be developing, with the result that neither the planned social nor economic benefits of the project are being realized.

One of the primary social benefits of the VFP was to be provision of adequate year-round domestic water. Some of the ponds visited represented a new source of dry-season water (as at Sai Ngam) and in these cases the benefit to the villagers is real and appreciated. Because some village wells traditionally have been located near the wet depressions which eventually were incorporated into the VFP ponds, the project has resulted in improvement in the recharge capacity of certain wells. In other situations there is little evidence the pond has significantly improved the availability of drinking water from village wells although use of the pond for bathing, washing clothes, and other household uses still could be important benefits.

Use of the project ponds for the watering of livestock was another anticipated social benefit. The team found that most ponds were used for watering livestock, but that in many cases this practice was unchanged from pre-VFP times when animals were brought to the wet land on which the ponds were constructed or improved. In some cases, apparently, the change has been the other way, where the traditional access to water by the animals was restricted after the VFP improvements. At none of the ponds visited was there a discharge conduit built into the pond embankment for delivery of water to a special area for livestock watering (or for other uses).

Other social benefits expected as a result of the VFP, such as a decrease in the level of underemployment and reduced emigration from the project villages, cannot be measured at this time. Given the generally low level of management of the ponds for fish production and other uses, it does not appear likely that these social conditions will be improved significantly in the foreseeable future as a result of the VFP.

Other activities called for in the VFP that were designed to contribute to improved economic or social conditions in the target villages have not received serious attention to date. For example, DOF village Site Teams were to be in place a minimum of 75 days each year to assist villagers in developing multiple-use pond management plans. The teams were to receive special training for this purpose and in turn provide on-the-job training for the villagers. A village fishpond management manual was to be prepared by the DOF for use in the project villages. Help was to be provided to increase use of the pond water for irrigated cropping and to assist villagers to develop sanitary domestic water systems. Operations research was to be conducted on integrated fish, livestock and horticultural crop production at the Nong Dern pond to determine suitable management systems for multiple-purpose uses of the project ponds. All these activities are included as important components of the VFP, yet they have been delayed or abandoned. The impact of the project has been reduced accordingly.

In summary, the VFP is an important asset in certain villages but in others it has not brought about the levels of economic or social benefits anticipated. Essentially the project has resulted in the construction of the planned 14 village ponds; some of which have serious design and/or construction faults, and a couple which should not have been built at all. The Provincial Fisheries Stations have stocked most of the ponds and others, recently completed, will be stocked in the coming months. The capability of the villagers to manage the ponds for high, sustainable yields of fish or for effective multiple-use purposes, however, is not well developed in many of the project villages.

2. Reasons for Limited Project Impact

The essential issue here is not so much that the VFP had only limited impact in the project areas, but why? There appear to be a number of reasons:

(a) Over-Optimistic Design

The project design was the result of a collaborative effort between the DOF and USAID (in a supporting role). As designed it was overly ambitious and had little, if any, chance of achieving many of its targets, particularly within a two-year time frame. In terms of its design, the VFP has been burdened with serious, basic constraints. For example:

- Most of the villages of the Northeast are poor; they engage in a low technology, subsistence-type rainfed agriculture. In some villages there is a problem with security because of insurgents. Also, to varying degrees the villagers have a traditional, conservative distrust of government programs. Under these circumstances, to expect the achievement of high levels of fish production as well as other managed, multiple-purpose uses of the ponds - which depends on full support of the village leadership and people - within a two year period, was unrealistic.
- The 14 villages selected for the VFP are widely dispersed over 12 provinces. This automatically creates serious constraints for DOF (or other agency) personnel to manage and support the project. The fact that the project was designed to be coordinated and managed from Bangkok, rather than from within the Northeast Region, further complicates the logistical support, coordination and management problems.
- The project includes components which require coordinated action of various agencies at different government levels (national, provincial, district) such as agricultural extension, livestock, health and community development. Yet, no mechanisms (or lessons from experience) exist that would provide for (or indicate the likely success of) such coordination.

- The project provided no production credit or other mechanisms for funding the anticipated increased village productivity.
- The fish production technology selected for the project is a mix of extensive methods (large, shallow ponds with little or no pond fertilization or fish feeding) coupled with certain features of an intensive system (nursery ponds, poly-culture). The project target to assist the villages to become self-sufficient in fingerling production (and thus the need for nursery ponds) may not have been necessary. In view of the circumstances in the villages, and the two-year time limit on the VFP, a project design that proposed a low-input, low-output fish production system (using Tilapia or other species which can reproduce in these ponds) would have been simpler and more likely to succeed.

(b) Failure to Modify the Project Design

Responsible USAID and DOF officers apparently failed to recognize or discuss the fact that many of the project targets could not be achieved, particularly within a two-year period, or that, in other ways, the project contained serious design flaws. This should have occurred early, when something might have been done to modify the project targets. As it developed, project implementation proceeded with this overriding handicap. Many of the problems encountered in implementing the VFP (and now, the sensitivity about this evaluation) can be traced to this initial failure to have, or to get by means of agreed modifications, a suitable, workable project design.

(c) Delayed Implementation

Implementation was delayed about 6 months while USAID and RTG/DOF struggled over the satisfying of the conditions precedent so that the project could get underway. This delay occurred in the first dry-season of the project when it was necessary that full attention be given to pond construction if there was to be any chance of successfully conducting the follow-on activities before the two-year project ended.

(d) Early Evaluation

With a two-year project that got off to a late start, the fact that this evaluation comes six months before conclusion of the project results in an attempt to measure achievement after only about one year of active implementation.

(e) Late, Poor Pond Design and Construction

Due to the factors above, and probably others, pond construction was not started until April 1980 (the Project Agreement was signed September 26, 1979). Because of the late start, four of the ponds could not be completed in the first dry-season. For the other ten, because the dry-season was well along, apparently there was little time to review the pond sites selected, correct designs or to properly supervise the contractors doing the work. Many of the design and construction problems observed by the evaluation team probably stem from the large amount of work hastily attempted (and apparently approved by USAID) during this brief period (the ten ponds were all completed by the end of June 1980).

(f) Inconsistent Role of USAID

USAID, after its initial concern about the details of the conditions precedent, appears to have taken a more relaxed attitude toward the day-to-day management of the project in regard to the stated and agreed objectives. Partly this was because the Mission failed to think through the complications inherent in the implementation of this sort of pilot project. Shortages of staff prevented assignment of a full-time Project Officer and no technical assistance was provided in the critical engineering and aquaculture components of the project.

(g) Lack of Strong, Full-Time Overall Project Management

DOF was tardy in providing strong, full-time leadership and management for the VFP. The Project Manager was not named until late January 1980. Even now, this officer has not been assigned full-time responsibility for management of the project, and serious management problems are evident. The national, provincial and district officers responsible for various aspects of the VFP, for example, have never been called together to discuss the project goals or to formulate a unified management strategy.

Drawdown of project funds has been slow because of delayed implementation of various project components by DOF, and/or RTG budgetary procedures (Appendix I). The \$20,000 budgeted for training of villagers remains unspent. USAID advanced \$1,838 in March 1981 to permit the start of Site Team training because of RTG delays in providing funds for this purpose as outlined in the Project Agreement. Unfortunately, DOF still has not conducted the training.

(h) Inadequate Site Team Coordination and Support

The DOF Site Teams - the critical points of contact between the RTG and the villages - are in place but do not appear to have adequate support from higher levels to do the job described for them

in the Project Paper. There has been little or no effort to integrate them into a unified VFP Management Team thus far. A two-person Site Team appears to be most common, with some combination of a Fishery Biologist, a Fisheries Extension Officer and/or a Community Development Officer; all three had been expected to make up a given team. In some cases each Site Team member is responsible to a different agency (Provincial Fisheries Station or Provincial Fisheries Office or the Community Development Agency) - a situation made more difficult by the absence of a central coordinating body for the VFP activities in the Northeast Region, close to the action. The VFP village is often an added responsibility on top of the Site Team officers' already overloaded schedules, making it difficult for them to spend the 75 days per year expected at each VFP village.

A more basic problem, though, has been the postponement of the DOF training of the Site Teams (due in part to delayed release of funds from the Bureau of the Budget (BOB)), originally scheduled for March 1980, but which still has not occurred. While often the Site Team members have had fisheries training, they have not been taught about integrated pond use management (to include fish production) nor have they received a thorough background on what VFP is all about and what it is they are trying to pass onto the villagers.

(i) Apparent Different Perceptions of Project by DOF and USAID

Either from the start, or at some time during implementation, it seems reasonable to conclude that the DOF had, or formed, a view of the VFP different from that outlined in the Project Agreement. It could be that the DOF came to perceive of the VFP less as a discrete economic development project (as USAID does), with quite specific economic and social targets to be achieved in the two years, than as part of a general, rural population stabilization strategy requiring a longer implementation period. The VFP seems, at this point, to be losing its distinctiveness as a project. It could be in the process of being absorbed into the RTG/DOF's concept of the role of village ponds as part of a broad, nationally-supported civic-action/counter-insurgency type effort. The goals of this strategy are not the same as the specifically focused, economic development goals of the VFP.

3. Considerations for the Future

In spite of the obvious problems encountered in implementation of the VFP-I, the evaluation team feels confident that the natural and human resources are available for a more effective village fishpond development effort. From the experience to date, an important need now is for DOF/RTG and USAID to reconsider the basic assumptions and strategy for such a project.

Specifically, it seems possible to design a project with more realistic targets and with a closer focus on the types of activities DOF can and should be attempting in the poorer rural areas. Many of the problems associated with the VFP-I can be avoided by a well-designed follow-on project which should be part of the DOF's 5-year national fisheries development program. The lessons learned in VFP-I can serve as extremely useful guidance in designing and implementing such a project. Particular care will be needed in developing a workable strategy that provides for a structured, responsive project management system from DOF headquarters to field level. Many of the recommendations included in this evaluation report will have application to such a follow-on project. In addition, section VI-B contains specific recommendations for DOF/RTG and USAID to consider in discussing the planning of such a project.

4. Major Recommendations Regarding USAID-Assistance

(a) Assistance to the VFP-I should be allowed to end as presently scheduled in December 1981.

(b) If agreement can be reached between RTG/DOF and USAID on a suitable set of objectives and the implementation strategy, USAID and DOF should provide a joint Thai/U.S. team for up to three months to prepare a detailed Project Paper for a follow-on project. Suggestions for the make-up of the design team and for the project generally are included in part VI-B of this report.

(c) The DOF and USAID should agree on the suitability of using unexpended project funds for selected training, commodities for Provincial Fisheries Stations and project village sites as well as for socio-economic studies, seminars, etc. Major focus should be on use of these funds to strengthen the existing project management capability leading to a generally improved ability to design and implement a follow-on project. (Suggestions for the use of the unexpended funds are included in the recommendations for a follow-on project as well as in Appendix J.)

B. Appropriateness of Pond Site Selection, Design and Construction

One goal of VFP-I is to construct low-cost, multiple-use ponds with emphasis on dry-season water availability. The purpose of this section is to review the technical suitability of the pond site development up to the present time as relating to the specific goals and objectives of the VFP. Problems in the pond site development were evident in some of the VFP-I ponds visited. The following presents discussions and conclusions as well as some recommendations on the related problems:

1. Site Selection

Apparently, no engineers were involved in site selection of the VFP-I ponds. Consequently, site selection was poor in more than half of the 10 ponds visited, either due to unsuitability of soil, water supply, topography or in relationship to development cost, village needs or water-use potential. Clay content of the dikes and peripheral soils was quite low in most cases (below 20%). While little or no seepage was observed, because of the soil types the possibility of seepage exists which could result in reduction of water storage capacity for dry-season uses. Topography of the site is also an important factor in determining a pond's natural water supply and storage capacity. Insufficient water depth was the most severe topographic problem, causing an increase of rooted aquatic weeds and thus restricting pond uses and promoting other environmental problems. Development costs of some ponds were found to be excessively high while other ponds were too inexpensive, raising doubts about the useful life of the project ponds. The village needs and water-use potential also were observed to be low in some of the villages selected; for example, the villagers of Ban Klang and Nong Phai had other nearby ponds with sufficient water for their consumption needs and other uses.

2. Design Features

It was estimated in the VFP-I Project Paper that the storage capacity of a pond to serve a typical community of 100 families over the dry-season would be on the order of 100,000 m³, or 1,000 m³ per family. From the investigation, it was found that the designed storage capacities of only two ponds, at Nong Dern and Phran Pan, could supply the full demands of the communities, as specified in the Project Paper. Three other ponds could nearly supply full demands. The remainder could supply only about one half of the full demand. The water depth in the 10 ponds visited, however, was found to be more than 50 centimeters because the pond water was only used for bathing, washing, livestock and fish production while the main consumptive uses such as drinking, gardening and rice-seedbed irrigation in the vicinity of the ponds was still limited. Clearly, effective water-use policies and operational management of each pond should be determined and applied by each community committee under the technical direction of each project Site Team.

Although the availability of water in the dry-season was found to be largely sufficient as a result of pond development, if effective use-policies and management were applied, the designs of the embankment, spillway, water inlet and outlet of the ponds were found to be lacking in many engineering requirements. The following problems were found in some of the VFP pond designs:

(a) Some structures were over or under-designed; for example, the spillway at Phran Pan was found to be over-designed compared to the relatively small contributing watershed area, the gentle slopes of the land and available storage volume. On the other hand, the spillway at Yang Song was very small and under-designed.

(b) Some structures were poorly located; for example, the spillway at Sai Ngam is located very close to the outer bank of the stream bed which will be subjected to severe erosion from flooding in wet-seasons and the water will flow into instead of out of the pond.

(c) Some necessary structures were not provided in the designs; for example, gated inlet and outlet structures were not provided for the majority of the ponds. Only one gated outlet structure, at Sai Ngam, was designed and constructed. At the other ponds, the villagers had to make decisions about where to place inlet pipes in the embankment, and had to do the work themselves without guidance. Due to the lack of technical direction, the installed inlet pipes were found to be too high or too low and thus caused flooding of some private lands on the upstream portion of the inlet pipes. In another case, the water could not be stored higher than the inlet level unless the inlet pipes were blocked with clay by the villagers when the water was high enough in the pond. Most of the inlet pipes installed by the villagers were too small for the natural inflow and they lacked structures to hold screens to prevent the escape of pond fish or to prevent wild fish from entering the pond. Except for the one mentioned, no outlet pipes were installed at any ponds visited and thus it was not possible to drain the water by gravity from the ponds.

(d) Some designs were based on inaccurate survey maps and insufficient knowledge of local soil conditions. Most of the ponds located in areas of sandy soil were designed with excessively steep embankment slopes. Normally, a side slope of 1:2 to 1:3 should be used for an embankment constructed from silty to sandy soil. But side slopes of 1:1.5 to 1:2 were adopted in most of the embankment designs for the VFP ponds. Without proper compaction and sodding on these side slopes, it was found that the dikes of 5 ponds visited (for example, those at Yang Song and Nong Fai Mai) were being eroded by rain water. Fortunately, evidence of seepage through the embankments was not found at any of the ponds.

Due to the poor survey maps, the dikes and spillway crests of some ponds were found to be too high, causing flooding of some private lands located in the proximity of the ponds; for example, the ponds at Non Tao Hai, Phran Pan and Nong Pluai. At Hin Lat, the dike was too high and extended far into the private lands, apparently due to errors in the survey, design and/or construction.

(e) The designs were made by engineers and/or technicians of many different governmental agencies at the request of DOF; for example, Provincial Fisheries Stations, Public Municipal Works, Changwat Administration Organizations (through the Accelerated Rural Development Office) and the Royal Irrigation Department. Certain design drawings lacked some essential details (e.g. contour lines, dimensions and elevations of structures, etc) and do not all conform to the same assumptions or principles partially, at least, because of the limited time available for the design phase. This made it difficult for USAID and DOF engineering offices to check and make corrections on all of the designs in the limited time they had. Some unclear points in the drawings and the construction specifications, therefore, led to some differences between the design and the constructed structures. For example, the constructed wing walls of the spillway structures at Yang Song, Tao Hai and Hin Lat were found to be parallel instead of inclined to the direction of the flow and thus were causing erosion of the embankment near the end of the wing walls. With the appropriate technical direction of the construction supervisor, these faults should have been minimized or eliminated altogether.

3. Construction Features

As observed during the field investigation, water can be stored in most of the ponds visited without any significant seepage. However, there are a number of construction features that need to be corrected, or at the very least improved, and which make the systematic maintenance of the dikes, spillways and inlet pipes by the villagers and the concerned agencies all the more crucial if the ponds are to remain functional. The following are the major construction problems found:

(a) Most of the dikes constructed are of sandy or silty soil instead of a clay soil. Therefore, without proper compaction and sodding, the dikes are subject to some degrees of erosion by rainfall and surface water. Evidence of the erosion due to these faults can be seen at most of the ponds visited but severe erosion needing prompt repair was observed at Yang Song, Nong Fai Mai and Hin Lat.

(b) Some dikes and spillways were not constructed according to the design drawings and specifications. These faults may result from negligence of either the construction supervisor or the contractor. Some of the observed faults are as follows:

- Excessively wide and high dikes compared to the design, e.g. Sai Ngam, Nong Dern, Hin Lat;
- Insufficient compaction and/or use of improper compaction equipment, e.g. compacting of clayey soils with dozers instead of rollers; compacting only at the topmost layer of the dike, e.g. Nong Fai Mai, Sai Ngam;

- Insufficient removal of vegetative cover at the embankment and spillway construction site; also there may be no core trenching under the embankments, e.g. Yang Song, Phran Pan, Hin Lat;
- Excessively high spillway crest compared to the design, e.g. Nong Pling, Hin Lat.

(c) Some necessary items to be done by the villagers have not yet begun and some are insufficient or ineffective, including constructing nursery ponds, sodding the embankment slopes, dredging the shallow ponds, weeding the ponds and maintenance of the embankment, etc. Insufficient or no sodding after completion of the embankment construction usually leads to some degree of erosion of the embankment during the next wet-season due to the high erosion potential of the sandy or silty soil. At several VFP sites, although the villagers had completed the sodding, there had been no watering or fertilizing of the grass to support its growth and it eventually died.

Dredging the pond and putting the soil-mud mixture on the embankment slopes is, thus, recommended before the sodding is done. Other items that should be done by the villagers as soon as possible are nursery ponds, weeding and dredging if basic outputs of the project are to be achieved. Only a few of the 10 ponds visited had one or two nursery ponds in the vicinity of each fish-pond. Some nursery ponds were inadequate in area and/or depth and should be improved according to the technical direction of the local Site Team. Weeding and dredging should be done, especially at Yang Song, Nong Dern, Non Tao Hai, Nong Pling and Phran Pan.

4. Least-Cost Considerations

Unit contracted construction costs for the 10 VFP sites visited ranged from $\text{฿}1,087/\text{rai}$ to $\text{฿}17,576/\text{rai}$ (US\$340 to \$5,493/ha) with an average unit cost of $\text{฿}5,183/\text{rai}$ (US\$1,620/ha). However, if the total of the 14 VFP sites is taken into consideration the range of unit construction costs is from $\text{฿}1,087/\text{rai}$ to $\text{฿}21,094/\text{rai}$ (US\$340 to \$6,592/ha) with an average unit cost of $\text{฿}6,416/\text{rai}$ (US\$2,005/ha). Calculating in the same manner, the average pond area of the 10 ponds is 149 rai (23.8 ha) and of the 14 ponds is 140 rai (22.4 ha), with a range of variation from 32 to 750 rai. It can be seen that the unit construction cost and the area of each pond varied widely according to the topography of the pond site selected. Therefore, it is difficult to determine the appropriate least-cost of pond construction in terms of the unit cost, but for a typical pond it can be determined as in the following section.

In the Project Paper, cost estimates for a typical fish pond (by Contract) is $\text{฿}494,000$ (US\$24,000 approx.). Therefore, total construction cost for the 14 ponds was estimated as $\text{฿}6,920,000$ approximately (US\$346,000). From the contract prices of all ponds,

construction costs per pond vary from ₪96,122 to ₪999,100 (US\$4,806 to \$49,955) with an average cost of ₪463,472 (US\$23,174) per pond, or a total construction cost for all ponds of ₪6,488,609 (US\$324,430). The average contract cost is then 6.2% lower than the estimated one for the typical pond. However, the total construction cost is found to be 8.4% higher than the pre-contracted, detailed cost estimates for all ponds which is ₪5,984,977 (US\$299,249). It appears, therefore, that least-cost considerations were not given serious attention in the VFP since in a number of ponds, design and construction were excessive to the needs while they were inadequate at the other ponds because of cost reductions to keep the total cost within the construction budget. From the engineering point of view, the typical construction cost of a pond at present should be on the order of ₪500,000 (as a rough figure) including the cost of embankment sodding. However, in any future project of this type a detailed cost estimate should be made before an exact value can be adopted since the unit costs vary from time to time.

5. RTG/DOF Engineering Capabilities

The DOF's Engineering Section currently has a total of 35 civil service staff plus a number of other employees. Most of the available engineering personnel are technicians with only certificate diplomas. Therefore, local provincial authorities (ARD, DOF, RID, etc) under the direction of the Governor, were responsible for engineering plans, contracting and construction supervision of the VFP-I ponds. The DOF's Engineering Section was assigned to review all plans for adequacy and correct them as necessary, and then inspect and ultimately accept or reject construction activities.

On the basis of experience to date, the surveys, design and construction supervision prepared or done by the provincial level needs to be corrected, or standardized as necessary. It seems impossible to expect the limited engineering personnel of the DOF's Engineering Section to correct, inspect and accept the designed and constructed works in light of their already heavy schedules.

Therefore, the engineering capability of DOF for providing timely and adequate supervision of pond construction and anticipated rehabilitation of existing project ponds is inadequate at present, or until the number of engineers and technicians is increased to a more reasonable number for the work assigned. The capability of DOF to handle increased responsibility in carrying out similar engineering work in the future is also questionable.

Water resource and environmental engineers, required to effectively address the problems of erosion, sodding and compaction of embankment, water seepage and pollution, as well as aquatic weed control, are also not available or adequate in DOF at present. This contributed to the problems in the VFP-I pond construction as stated above.

It is recommended, therefore, that the other governmental agencies such as the Royal Irrigation Department (RID), the Department of Land Development (DLD), and the Accelerated Rural Development Office (ARD), which already have large engineering staffs and established expertise in tank and reservoir construction, should be asked to assist DOF in survey, design and construction supervision of any future pond project. Arrangements with these agencies can be made through the Ministry of Agriculture and Cooperatives (MOAC). In addition, plenty of local engineering consulting firms are available in Thailand and can assist in all phases of pond site development as well as in the study of the environmental effects due to the pond construction.

6. Availability, Capability of Private Contractors

Because of the limited construction equipment of DOF, mainly for small construction and maintenance work, the construction of the 14 VFP-I ponds was done by private contractors. Most of the private contractors interviewed showed a high level of interest in the construction of the VFP-I ponds as well as the additional new ponds envisioned in a follow-on project. With the limited construction capability of the Engineering Section of DOF, it seems that involvement by the private sector is appropriate and necessary to assist DOF in the construction for any future pond development project.

There are hundreds of construction companies in Thailand that can be of assistance to the DOF in pond construction. The present number of private construction companies in Bangkok and local provinces combined are adequate for such purposes. However, in some of the provinces, only a few local private companies have sufficient required construction equipment and engineering staff capabilities to meet the pond specifications. Therefore, it is recommended that the private companies in Bangkok and big cities of the Northeast should be selected as construction contractors in other provinces where the available companies are not adequate. It is also important that before a contractor can be selected, he should certify that he has the required equipment available for the pond construction.

7. Conclusions

From the above discussions, the following points can be concluded:

(a) Rainfall and other water drained from the existing watershed areas is sufficient to fill the VFP-I ponds. The water holding capacities of all project fish ponds visited, under present conditions, would be adequate for multiple uses of water both in the wet-season and dry-season provided that the ponds are properly managed by the village committees.

(b) The expected environmental changes resulting from new water impoundments should be the reduction of aquatic vegetation growth, the increase of siltation or sedimentation in the pond, the increase of potential ground water recharge and thus increase of ground water level and discharge of water in the vicinity of the ponds.

(c) Construction in the VFP was generally not satisfactory due to many problems during site selection, design and construction supervision as described above. These problems can be reduced in the future if timely provision of appropriate personnel and funds by the concerned agencies are adequate and there is good coordination between these agencies.

(d) The least cost for any ponds to be constructed in the future should be carefully considered. Smaller and deeper dug-out ponds might be more suitable for fish production and other purposes in the Northeast and could possibly be constructed at a lower unit cost.

(e) The engineering capability of DOF to provide timely and adequate supervision of pond construction and to rehabilitate existing ponds is low at present. For similar works in the future, the DOF cannot provide adequate engineering personnel and, thus, needs the other government agencies and the private sector to assist in all phases of future pond construction.

(f) Private contractors are highly interested in any future fishpond project. The numbers and capabilities of the contractors are adequate to assist in the construction work. However, in some provinces, only a few local private companies have the required equipment and engineering capabilities. Therefore, it is suggested that private contractors in Bangkok and big cities of the Northeast should be selected as contractors for those provinces where the available companies are inadequate.

8. Recommendations

(a) Timely and adequate personnel and funds should be provided for the site selection, design and supervision of any future, similar pond development project. DOF should seek assistance from other government agencies such as RID, DLD and ARD for this work

(b) Pond site development activities should have more effective management by the concerned agencies, especially DOF and provincial governments, as well as the village committees.

(c) If possible, the construction of nursery ponds (and other works which are needed immediately after the construction of the embankment and spillways, such as sodding and dredging) should be included in the construction contract so that the ponds could be effectively constructed and the useful life of each pond would be extended without more frequent maintenance.

(d) The private sector companies should be carefully selected to assist DOF in all phases of the construction in the future because the capability of DOF in construction phases is not adequate. Although more funds might be needed for the contracted works, the results would be acceptable with respect to the quality of the construction work.

C. Fish Production Technology

This analysis evaluates the suitability and achievements of the fish production components of the VFP. Conclusions are drawn on data collected during visits and interviews with VFP village committees, private fish farmers, faculty of Khon Kaen University, RTG Border Patrol Police (Region 2), DOF provincial fisheries station officers, DOF village Site Teams and officials of the DOF National Inland Fishery Institute (NIFI).

The questions addressed are:

- Was the fish production plan feasible for the development of a viable village fishpond production system?
- Were the ponds suitable for fish production?
- Were the inputs available and present on a timely basis?
- How did the actual fish yield compare to the assumed yield?
- How did the fish production technology for private fish farms compare to that being used at the VFP sites? What is the capability of the private sector in reference to supporting expanded fish production development in the Northeast?
- Was the support and management capability of DOF adequate for effective project implementation?

1. Feasibility of the Fish Production Plan

The fish production plan proposed by the project is too advanced for development conditions in the Northeast. Polyculture, multiple stocking and harvesting, the use of fertilizer and supplemental feed, hormone induced spawning and integrated fish-livestock production to exploit the maximum carrying capacity of the pond represents an advanced system that requires more infrastructure, technology, production inputs and management capability than the present project has been designed for, or is capable of delivering.

Furthermore, while the project recognizes the importance of water storage for domestic use, the fish production plan did not fully consider the complications associated with management of the pond water for both domestic uses, and for intensive fish production (the need for fertilization and multiple harvesting of fish, etc).

Thus, based on the villagers' highest priority - use of the water for domestic purposes - as well as the unsuitable environmental conditions, limited production inputs, low technology farming practices and low economic base of the region - the fish production strategy should have been initially limited to the establishment of a simple, low-management extensive system.

2. Suitability of Ponds for Fish Production

The construction of ponds for water storage and fish production was the foundation upon which the VFP was to be built. However, in reality, it is one of the major project constraints. While most of the ponds observed did have dry-season water storage capability, all had been designed and constructed with very little consideration of the porous soils and high evaporation rates, or for the operation and management requirements of a fish production system.

Overall, the potential for production from most of the ponds was limited due to one or more of the following:

- (a) Shallow water (less than 1 meter in fifty percent or more of the pond area);
- (b) Presence of rooted aquatic weeds in twenty to fifty percent of the pond area;
- (c) Terrestrial vegetation not removed;
- (d) Non-innundated areas within pond;
- (e) Pond bottom not level;
- (f) No screens on inlets and spillways;
- (g) Subject to flooding;
- (h) Unable to drain the pond;
- (i) High level of suspended solids;
- (j) High water loss (fifty percent) during dry-season due to seepage and/or evaporation.

3. Availability of Inputs

The planned VFP fish production system was based mainly on the expectation that resources would be available at the village level. Basically, those inputs were organic fertilizer (manure) and fingerlings. It was assumed that 672 kgs/rai/year (4,200 kgs/ha/year) of manure would be available in the village for fertilizing the ponds and that all villages would be self-reliant in the production of fingerlings by the end of the project.

However, the evaluation team found that livestock production in the village was not only limited, but free ranging, and that almost all of the manure collected was used for crop fertilization. A few villages had occasionally added limited amounts of manure to the main pond and a few of the villages that had nursery ponds in operation were using some manure to support the fingerling production, but not in amounts that were close to the predicted levels.

Most of the villages did not have nursery ponds; of the ten villages visited only three had nursery ponds in operation. Two villages had both nursery ponds constructed, but only one had both in operation. While the project predicted that each village nursery pond system would be capable of producing 200,000 fingerlings per year (two crops per nursery pond), the one village that had both ponds in operation had produced 50,000 for the first cycle of six months. Thus, it appears that DOF will have to provide fingerlings to most of the villages for another two or three years.

4. Assumed and Actual Fish Production

The project assumed that production yields would range from 1,500 to 2,150 kgs/ha/year. In practice, the yields (two ponds) have been 52 and 77 kgs/rai/year (322 and 484 kgs/ha/year). While it might be argued that these yields do not represent the total harvestable fish in the pond - as harvest periods were limited to one day for each pond and neither pond was drained - it appears the yields are reasonably close to that of a maximum harvest under the prevailing conditions. (Watershed ponds in the southern United States yield approximately 80 kgs/rai/year (500 kgs/ha/year) under similar extensive production conditions.) Therefore, it appears that a yield of 80 kgs/rai/year probably represents optimum production for the existing low fertilization and low-level management system.

5. Private Fish Farms

As a general rule, fish production in the private sector is not widespread in the Northeast. The private sector is made up of a few commercial producers (three to ten per province) who are primarily producing fingerlings for sale to a number of small farmers

(ranging from a few hundred to a few thousand per province) for extensive-type fish production in rice fields and rice-paddy ponds.

In contrast to the extensive type production practiced at the village and small fish-farmer level, commercial fish farmers were generally practicing intensive-type fish production, usually integrated with livestock production. Most of the privately owned fish farms observed were small in size (10-20 rai; 1.6-3.2 ha) but modern and well-managed. Most had been established with technical assistance from DOF. The water supply for these facilities generally came from private rainfed storage reservoirs, although most facilities had water back-up from private wells or RTG irrigation systems.

From the visits and interviews of the evaluation team, it appears most of the commercial fish farms are viable operations. Most of the private fish-producers indicated that they planned to expand their businesses in the future.

6. Support Capabilities of DOF

Based on the limited project achievements, it is apparent that DOF, as the lead agency, has not provided an adequate level of support to the project.

In general, it appears that the project implementation effort was largely limited to the DOF village Site Team and their immediate supervisors at the provincial or regional office. Their efforts were not well supported by administration, management, training and research; it seems that DOF was lax in organizing and scheduling the project inputs, in establishing responsibilities and assigning adequate management, as well as in monitoring and evaluating the VFP.

7. Conclusions

The lack of achievement of the VFP clearly shows that design of the project was not appropriate for the development of a viable fish production system in the rural Northeast. The design was inappropriate in the first place, because it did not take into consideration the complications that would result in reference to the production of high levels of fish and integrated fish/livestock production. Further, the ponds were either not suitable for managed-type fish production, or inputs were not available. (While DOF had provided an adequate number of fingerlings for the initial stocking, very little progress had been made by the villages to achieve self-sufficiency in fingerling production.) Outputs of fish production for the few villages that had produced a crop of fish were at an extensive level of approximately 80 kgs/rai/year (500 kgs/ha/year), considerably less than the predicted level of 240 kgs/rai/year (1500 kgs/ha/year).

In addition to these problems, the project fell behind in its implementation schedule and has suffered from a lack of effective management. While the DOF is a reasonably well established institution, and would be expected to be able to provide an adequate level of

support and management for this type of project, such has not been the case in the VFP.

8. Recommendations

(a) The DOF and USAID should design projects of this type to be extensive low-management fish production systems and use a simple method such as the stocking of species that will reproduce naturally and will require the least management ability that will allow the villages to become self-sufficient.

(b) DOF and USAID should expand the village fishpond concept so as to view the function of the main pond as a facility to produce food fish (at the extensive level) and fingerlings to backstop the nursery pond operation, which in turn would supply fingerlings to stock rice-cum-fish, rice paddy ponds or fish trap ponds instead of for restocking the main pond. (The tilapia will establish a reproducing population that will restock the main pond, without requiring management inputs.)

(c) The DOF should develop standards for the construction of ponds that take into consideration the requirements for fish production.

(d) The DOF should establish teams (at regional or provincial levels) of pond construction specialists to design and monitor DOF pond construction activities.

(e) The DOF, with assistance from one or more RTG agencies having expertise in pond construction, should re-survey all fourteen of the existing VFP sites to evaluate the feasibility and cost for renovation or modification of the ponds, in reference to improving water storage and fish production potential.

(f) DOF should reduce stocking rates in all village ponds to 1200 fingerlings/rai (7500/ha). Present stocking rates of 2200 to 7000 fingerlings/rai (13,750 - 43,750/ha) greatly exceeds that recommended for the level of nutrient inputs (fertilization rates).

(g) Where DOF desires to achieve higher fish production levels, it should formulate methods and mechanisms for expanding the use of inorganic (NPK) fertilizer. DOF assistance in establishing a source of fertilizer credit and control over the quality, quantity and price of fertilizer inputs for VFP villages will also become essential due to RTG's balance of payments and needs for fertilizer in other agricultural areas.

(h) DOF should periodically evaluate the actual cost of producing fingerlings, to help establish and maintain prices that are fair to both the producer and farmer.

(i) DOF should examine its organizational and management structure in order to determine if improvements can be made in its capability to provide an adequate level of support to the VFP or any follow-on projects.

(j) The VFP needs a suitable management system in place before much can be done toward developing appropriate reporting procedures. The following general comments, therefore, apply after the DOF Project Manager (with the USAID Project Officer's assistance) has instituted a comprehensive project management system. As part of such a system, information should be gathered at the project villages by the Site Team (in cooperation with the village committee) on a regular, monthly basis. A standard reporting form should be prepared by the DOF, and the information flow - from the Site Team to province office to regional level and then to the DOF Project Manager (with copies to the USAID Project Officer) - should be established. As a minimum, reporting should include the following:

- Fingerlings stocked (size, number and species)
- Fish growth (bi-weekly weight and length increases)
- Food fish harvested (total weight and count/kg for all species)
- Food fish sold (price/kg)
- Brood fish stocked (size, number and species)
- Fingerlings produced (size, number and species)
- Fertilizer and feed inputs (kgs and cost)
- Percent water capacity of peak storage (maximum depth and percent area)
- General comments (constraints, training activities, recommendations, projected inputs for subsequent quarter - updated monthly, scheduled pond management activities, etc)

(k) USAID and DOF should use remaining project funds for management training and to establish demonstration sites at Sai Ngam, Fai Mai, Nong Pling and Nong Pluai villages, and to transport village representatives from other VFP villages to observe the results. (Details are presented in Appendix J.)

D. Management Considerations and Economic Benefits

1. Village Committee Management Capabilities/Activities

Village committees, comprised of about a ten-man group, are present in all villages. In Sai Ngam, where a strong village leadership exists, some production plans have been implemented quite

satisfactorily and a substantial return in terms of fish production can be expected. For the most part, however, well-developed VFP operational plans do not exist in the project villages.

Pond size and number of villages benefited by a pond seem to have a negative correlation with effective pond management; smaller and single-village-owned ponds actually receive better attention and, in turn, better management and maintenance from the villagers, (e.g. sodding of embankment, adding manure to pond or removing of weeds, etc) than do the larger, multiple-village-use ponds.

In most villages there has been no clear attempt to maximize fish output; for example, manure has generally not been added to the pond. Sodding of the embankment was done, in most cases, only once, right after pond construction (except for Sai Ngam where the embankment apparently was sodded 2-3 times). There is no serious problem of weed growth in most ponds. In Yang Song, however, where most of the pond surface is covered with weeds, the village committee, after several attempts of trying in vain to remove the weeds, is now reluctant to do it again.^{1/}

There has been no attempt to remove predator fish from the VFP ponds, with the exception of Sai Ngam, where the activity was reported more than ten times. Other activities, e.g. lime application, removal of sediment or drying of the pond, if done at all, were done in small ponds and only once. To date, the village committees' knowledge of improved fish production techniques is not at a satisfactory level; there is need for improvement.

As far as the multiple-purpose uses of the VFP ponds, distinct and rational management is not practiced to make best use of pond water to serve the needs for livestock water, fish production, domestic water and dry-season crop production, etc. At all ponds, villagers feel free to utilize pond water for domestic purposes. Use of the water for livestock, however, varies from pond to pond. In some ponds, livestock are allowed to drink or even bathe in the pond freely, whereas in other ponds animal owners must carry the water to their livestock, as animals are not allowed to come near the pond. For fear that livestock trespassing on the pond may result in lower fish production, committees of some ponds even plan to fence the ponds.

The increase in new cultivated areas for garden and orchard crops is questionable. The evaluation team observed only limited pond-side lands brought under cultivation for such purposes. Most land around the pond is privately owned. Public shared communal vegetable growing areas were found only in two villages, one of which had just been

1/ It is difficult to obtain free labor here since laborers were paid for the same kind of job nearby by other government agencies under the Job Creation Program.

started. According to interviews with the village committees, some villagers do use pond water for crop cultivation on an average area of 30 rai/pond (4.8 ha) with an average size of $\frac{1}{4}$ rai/family (.04 ha). The use of pond water for earlier planting of rice seed-beds is highly unpopular; out of the ten ponds visited, land area used for this purpose probably did not exceed a total area of 2 rai (.32 ha).

In most cases pond-use policies are determined by the village committee, supposedly with the consent of all the villagers, and with consultation from the Site Team and/or other local government officials. Regulations and benefit distribution, however, are determined by the village committee and the villagers themselves. In some villages, disagreement did occur when the committee wanted to harvest the fish once a year, and the villagers wanted two harvests.

In most ponds, individual harvest of the fish is forbidden and villagers are allowed to fish only on the fishing day fixed by the committees. A fee of, say, $\text{฿}25$ per cast net and $\text{฿}10$ per lift net is charged on that day. However, pond regulations differ from place to place; in one place individual fishing is strictly forbidden, in another place fishing is forbidden for about 6 months starting from the day of fingerling release. After the fishing day anyone is free to harvest the remaining fish until the day of the next fingerling release.

It is difficult to determine the equity of benefit distribution. Whereas the benefit of pond use, in terms of household water, is viewed as equally shared among villagers, some problems arise for those who usually fish all year round and cannot do so after the pond use regulations have been set. The same argument applies to the livestock owners whose livestock are no longer allowed to use the pond water freely after pond improvement.

Persons who enjoy increased benefits are those who control land around the pond; the increase of pond water does benefit the productivity of their land to a great extent. The benefits realized from fish production depend, of course, on the amount of fish each individual captures on the fishing day. Money generated from the fishing fees, in an economic sense, is only a transfer payment from villagers to villagers themselves and thus cannot be counted as a benefit. It was learned that this money was to be kept by the committee and set aside for purposes of pond maintenance and other public uses, e.g. building of temples, construction of village roads, etc.

2. Site Team Capabilities/Activities

In their responsibilities for management coordination with village committees, the capabilities of the Site Team to encourage village cooperation vary with and depend on various factors and constraints.

Though a three-person team consisting of one fisheries biologist, a fisheries extension officer and a community development officer was planned for every Site Team, most existing teams consist of only two persons, one biologist and one extension officer. These Site Team members were recruited from the local Provincial Fisheries Station and/or Provincial Fisheries Office to be responsible for VFP activities as a kind of special mission on top of their existing responsibilities. Since lack of manpower has already been a problem in these government agencies (one biologist working for more than one province is quite common) the Site Team members, already overloaded with their daily work, can hardly be expected to work for VFP activities on a full-time basis.

The number of days a Site Team spends in a VFP village varies from a maximum of 14 days/month to a minimum of 1 day/month; a 2-3 day visit/month is the most common practice. For VFP ponds located in remote areas, constant visits to the ponds can hardly be expected.

The major activity of the Site Team seems to be to secure fingerlings and feed (for some ponds) for the villagers. The important role envisioned for the Site Team, the activation of local cooperation to achieve effective pond management for optimum pond use in most villages, is not yet realized. Since there is no Project Manual and the Site Teams are untrained, the proposed on-the-job training for the villagers to manage their fish pond has not yet taken place. And since the objectives of the VFP have not been clarified, and thus clearly understood by both parties - the Site Team, and the village committee - local acceptability of the VFP varies from pond to pond depending on the personal capabilities of the Site Team members, coupled with the absence or presence of strong local leadership as well as, of course, many other constraints.

3. Economic Benefits

So far, the quantifiable economic returns from the VFP mainly consist of three parts: the production of fish, use of domestic water and the increase in the cultivation of gardens and orchards. To date, there is no evidence of earlier planting of rice seedbeds to a significant level and the likely benefits that may be realized from animal husbandry cannot be evaluated in economic terms.

For fish production, since not all ponds are harvested, the economic benefits cannot be readily determined. Judging from the two ponds (Ban Klang and Nong Pluai) that have been harvested, the fish production generated from Nong Pluai (102.45 kg/rai, 640 kg/ha) is quite satisfactory whereas the production of Ban Klang (26.46 kg/rai, 165 kg/ha) is considered rather low in comparison with the expected yield of 54 kg/rai (338 kg/ha).

The benefit of the VFP in terms of domestic water utilization varies from village to village. For instance, in Sai Ngam, Yang Song and Nong Dern, villagers do not use the fishpond water for domestic

purposes since they have enough wells in the villages and since the pond water is said to be muddy during the dry-season. Villagers in other villages do use the fishpond water to a certain extent. The number of families using the water for domestic purposes ranges from a minimum of 50 families in Ban Klang to a maximum of about 500 families in Non Tao Hai.

The use of pond water for gardens and orchards ranges from a minimum of 5 rai (.8 ha) in Nong Pluai to a maximum of 55 rai (8.8 ha) in Non Tao Hai. However, most lands adjacent to the fishponds are privately owned. Except for a few villages, where certain areas of adjacent land are shared among villagers for gardening, the benefits generated from dry-season gardens and orchards cannot be distributed among villagers.

The use of the pond water for rice seedbed irrigation is not popular among villagers and to date, the use of pond water for this purpose is very insignificant; thus, such benefit can be ignored. As for the use of the pond for livestock, even though the villagers do use the water for animal husbandry the benefits cannot be quantified in economic terms since nearby water sources are generally available for livestock. Besides, there is no evidence that easier access to water sources would result in a weight gain or an increase in the productivity of animals and in turn generate some benefits that could be translated into economic terms.

4. Economic Analysis

(a) Model Description

In this economic analysis, 4 models are constructed for a 140 rai (22.4 ha) pond, and these economic results are compared with the costs and returns generated from two harvested ponds: Ban Klang and Nong Pluai. All cost items are estimated using the cost pattern incurred in VFP-I as a guideline. On the benefit side, assumptions of optimal fish yields are made for the models in comparison with actual fish yields realized from the two ponds. As for other benefits, estimates are also based on what was realized from VFP-I.

In model-1 and model-2 fish production of 54 kg/rai (338 kg/ha) is assumed. For both models, stocking of 540 fingerlings/rai (3375/ha) is estimated for the first year and 490 fingerlings/rai (3063/ha) thereafter. For these two models no fertilizer or feed inputs are assumed. In model-3 and model-4, with a feed input of 360 kg of buffalo manure/rai/6 months (2250/ha), fish production of 270 kg/rai (1688 kg/ha) is assumed. The fingerling stocking estimates for these models are 2700/rai (16,875/ha) for the first year and 2450/rai (15,313/ha) thereafter. In model-1 and model-3 it is assumed DOF will provide the fingerlings to the villagers at a cost of $\text{P}120$ per 1000, whereas in model-2 and model-4, nursery ponds are assumed to be in operation and the villagers will produce the fingerlings themselves at an assumed cost of $\text{P}55$ per 1000.

All models are analyzed for two cases. In case A, the benefit from fish production alone is considered; in case B all other benefits are incorporated into the models. For all models, ranges of IRRs and B/C ratios are estimated to take account of the 100% of optimum fish yield and the 70% of optimum fish yield. For all models, off-season unemployment and year-round under-employment with zero opportunity cost of labor is assumed.

The following cost structures and benefits are used for the calculation of internal rate of return, benefit-cost ratio and the net present value of the benefit. The details of the calculations are in Appendix K.

(b) Assumed Costs and Benefits for the Models of a 140-rai Pond

Initial Cost (฿)

Pond Construction ^{1/}	898,240		
Less: 5% Tax to RTG ^{2/}	44,912		
10% Off-Season employment ^{3/}	89,824	=	763,504
Planning and Design ^{4/}		=	4,350
Training ^{5/}		=	13,600
Plus: 10% Contingency		=	78,145
			<hr/>
			859,599
			<hr/> <hr/>

1/ ฿6,416/rai is the estimated construction cost for a pond lasting for 15 years.

2/ For net RTG expenditure a 5% tax is deducted.

3/ VFP-I Estimate (About 10% of the construction cost is viewed as benefit for the off-season labor that otherwise would be unemployed.)

4/ Government officer's design with 14 day of survey plus a half month salary (45฿ x 14 + 1500฿) and 14 days for over-time design cost plus half month salary (30฿ x 14 + 1800฿).

5/ NIFI estimate in Project Paper.

<u>Annual Costs</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Thereafter</u>
NIFI Management ^{1/}	8,566	857	857	-
Site Team ^{2/}	14,560	14,560	14,560	1,456
Fingerling: Model-1	9,072	8,232	8,232	8,232
Model-2	9,072	3,773	3,773	3,773
Model-3	45,360	41,160	41,160	41,160
Model-4	45,360	18,865	18,865	18,865
Manure: ^{3/} Model-1	-	-	-	-
Model-2	-	-	-	-
Model-3	12,600	12,600	12,600	12,600
Model-4	12,600	12,600	12,600	12,600
Opportunity				
Cost of land ^{4/}	3,500	3,500	3,500	3,500
Fishing net ^{5/}	300	300	300	300

1/ VFP-I Average, assuming 100% cost for 1st year and 10% cost for 2nd and 3rd year, and no cost thereafter.

2/ VFP-I Average, assuming 100% for the first 3 years and 10% thereafter.

3/ 360 kgs of manure/rai valued at ₪250/ton.

4/ Assuming 5% of pond site land with the value of ₪500/rai foregone as economic rent.

5/ Assuming 400 cast nets. (Fishing net valued at ₪300 is estimated to be used for 80 fishing days/year for 5 years.)

Note: Labor alone is needed for maintenance and with the zero opportunity cost of labor assumed, no cost is assigned to this operation.

Benefits from fish alone

Model-1 and Model-2 (54 kg/rai) ^{1/} 54 x 140 x B25	= 189,000
Model-3 and Model-4 (270 kg/rai) ^{2/} 270 x 140 x B25	= 945,000
(70% of optimal yields)	
Model-1 and Model-2	= 132,300
Model-3 and Model-4	= 661,500

Other Benefits

Household Water ^{3/}	70,477
Garden and orchard crops ^{4/} (34 rai x B500)	17,000

- 1/ and 2/ Assuming a one six-month crop/year optimum output with no fish being lost to flooding, wild predator fish, etc.
- 3/ VFP-I average with the willingness-to-pay criteria of the villagers.
- 4/ 34 Rai is projected from VFP-I with an assumed value of B500/rai as benefit.

(c) Actual Cost and Benefits from VFP-I for Two Harvested Ponds

Ban Klang (110 Rai)

Initial Cost

Pond Construction	406,000	
Less: 5% Tax to RTG	20,300	
Off-Season Labor	48,000	337,700
Planning and Design		4,350
Training		-
		<hr/>
		342,050
		<hr/> <hr/>

1st Year Cost

NIFI Management	8,566
Site Team	37,723
Fingerling	29,040
Fishing Net	375
Opportunity Cost of Land	2,750

Benefits

Fish (2911 kg x B25)	=	72,775
Domestic Water		
(50 families x B2.5 x 120 days)	=	15,000
Garden and Orchard Crops		
(50 rai x B500)	=	25,000

Nong Pluai (40 Rai)

Initial Cost

Pond Construction	299,298	
Less: 5% Tax to RTG	14,965	
Off-Season Labor - None	-	284,333
Planning and Design		4,350
Training		-
		<hr/>
		288,683
		<hr/> <hr/>

1st Year Cost

NIFI Management	8,566	
Site Team	5,124	
Fingerling	47,100	
Fishing Net	180	
Opportunity Cost of Land	1,000	

Benefits

Fish (4098 kg x ₱25)	=	102,450
Domestic Water		
(180 families x ₱5 x 90 days)	=	81,000
Garden and Orchard Crops		
(5 rai x ₱500)	=	2,500

(d) Results of Calculations

Except for the 70% of optimum cases for model-1 and model-2 in Case A, the range of economic rates of return are acceptable in all cases. It is best in model-3 and model-4 where 360 kg/rai (2250 kg/ha) of feed inputs is assumed. The rates of return are slightly higher in cases where villagers produce their own fingerlings; this is justified by the estimated lower cost of fingerling production with village nursery pond. In Case B where other benefits are incorporated the rates of economic return are all acceptable.

As for the rates of return projected from the two actual harvested ponds: Nong Pluai having a fish production of 102.45 kg/rai is considered as acceptable with an IRR of 15.28% and a 1.09 of cost-benefit ratio, whereas Ban Klang with a fish production of only 26.46 kg/rai (165 kg/ha) did incur a loss with an IRR of 2.73% and a .73 of cost-benefit ratio in Case A. However, when other benefits are taken into account in Case B, both ponds are profitable with an IRR of 16.08% for Ban Klang and an IRR of 45.13% for Nong Pluai.

(e) Summary of Calculations

	IRR		B/C	
	(100)	% of optimum fish yield (70)	(100)	(70)
Case A: Model-1	19.91%	- 10.03%	1.30	- 0.91
Model-2	18.39%	- 10.61%	1.33	- 0.93
Model-3	100.95%	- 68.22%	4.93	- 3.45
Model-4	102.22%	- 69.73%	5.48	- 3.84
Ban Klang		2.73%		.73
Nong Pluai		15.28%		1.09
Case B: Model-1	28.82%	- 21.86%	1.90	- 1.51
Model-2	29.24%	- 22.31%	1.95	- .55
Model-3	111.07%	- 78.31%	5.39	- 3.91
Model-4	112.28%	- 79.74%	5.99	- 4.35
Ban Klang		16.08%		1.13
Nong Pluai		45.13%		1.97

- Case A - benefits from fish production alone
- Case B - with other benefits
- Model-1 - no feed input, no nursery pond
- Model-2 - no feed input, with nursery ponds
- Model-3 - with feed input, no nursery pond
- Model-4 - with feed input, with nursery ponds

5. Conclusions

Though village committees are named for all ponds, their capabilities to manage pond operational plans in order to achieve maximum fish production and optimum use of pond water are not well developed in most villages. To cope with this problem, well trained Site Teams free from other responsibilities are needed.

Benefits realized from VFP-I consist mainly of returns from fish production, domestic water and garden/orchard crops. Judging from the fish production from the two harvested ponds in comparison with the production models, there is room for improvement in terms of fish production. The restructuring of the project with more emphasis on management may hopefully make any future similar project very profitable. Production with village nursery ponds, though more profitable in the models, might be postponed until better local management capabilities are developed. Furthermore, attempts should be made to gear the production pattern from model-1 (no feed) to model-3 (with feed) to return higher benefit via better fish production.

6. Recommendations

(a) DOF should properly train Site Teams, and ensure they are available to make frequent, short visits to the VFP villages, to assist villagers to manage the pond for maximum economic benefits.

(b) DOF should restructure the project with greater emphasis on management to increase the economic returns of this or a future project.

(c) Given the present situation, DOF should give priority to small size ponds where more effective operations are possible.

(d) In addition to fisheries technical training, the DOF and USAID should consider the suitability of providing project management training for selected senior and mid-level DOF officers at in-country institutions or short-courses.

(e) In projects of this type, the DOF and USAID should strengthen their management teamwork to avoid long delays in meeting conditions precedent, and in on-going monitoring of the project. Wherever necessary, outside technical or other short-term specialist assistance should be provided by USAID and/or the DOF.

E. Social Considerations and Benefits

1. Introduction

This analysis considers the socio-cultural conditions of the Northeast people involved in the VFP. Data was collected through interviews with key informants and villagers regarding the benefits

of the VFP pond and acceptability of the technology of pond management. In addition, fish harvesting was observed at a few ponds.

The questions addressed are:

- Are social benefits perceived or realized on domestic water, livestock use, increase in the water table, increased irrigated cropping, rice seedbeds and decreased emigration?
- What are the probable nutritional benefits to villagers; what other activities would increase nutritional benefits?
- Is there an increased incentive to manage the pond based on villagers' perception of the pond as their own?
- How has the VFP changed the role of women?

2. Social Benefits Perceived or Realized

The people in the Northeast are very careful in their use of water. All water sources are used as efficiently as possible. Drinking water from wells, water for vegetable gardening and for animals are general uses in every village. Natural fish (i.e. snakehead and catfish) are the only animal protein food available in such areas. Some ponds are utilized for several purposes: domestic water, irrigation of vegetable gardens, for animals and fish raising.

One problem noted with the VFP is that villagers are not allowed to use the pond water as usual. They have to follow the established regulations. For instance, they are not allowed to bring any buffaloes or ducks to the fishpond (though removing water for them is allowed); they are not allowed to fish at certain times. Thus, some of the villagers have a poor attitude concerning the project, due to these restrictions.

In some villages, villagers have adequate water for small-scale irrigated, dry-season gardening. The area of gardening is not only on public land near the pond, but close to the houses as well. Grown in the vegetable gardens are chilli, eggplant, cucumber, onion, corn, tobacco, etc., produced for home consumption only. The average size of each family's home garden is 0.25 rai (.04 ha).

The level of the water table in wells can be directly affected by the ponds. Water from some wells near the pond is available year-round for drinking. In other cases, villagers have to dig a temporary hole beside the fishpond for drinking purposes.

Normally, rice-growing in the area is dependent on rainfall only. It appeared, therefore, that very few villagers supplied pond water for early planting of rice seedbeds. Also, because the seedbeds require at least 30 days before transplanting (during which time water must be supplied regularly), it is not possible for every household to use the pond water at the same time for the seedbeds.

A lot of seasonal labor migration was noted in some areas visited by the evaluation team. Villagers took work as unskilled labor in Bangkok, as house servants, as employees in textile factories or employees in sugar cane fields in Kanchanaburi Province. From this employment they could earn at least 2,000-5,000 baht a year. This situation is unchanged as a result of the VFP.

3. Improved Nutrition

Fish is the only protein nutrition food easily found in the Northeast villages. Increased availability of fish should result in increased consumption, but it was found that at two ponds already harvested, the people could not identify the amount of increased fish consumption. They just said that they had a lot of fish for fermentation and some for selling to other villagers.

4. Villagers' Perception of the Project

Evidently, some of the VFP ponds are not appropriate in terms of the villagers' needs. For instance, one pond was located in an area where 19 villagers operated individual fishponds (Nong Dern); another VFP pond was close to a pond full of natural fish (Ban Klang). In these cases, there is serious doubt that villagers will pay attention to the VFP project, and the villagers' perception of the pond as their own will be correspondingly weak.

Another factor which is directly related to the villagers' perception is the process of site selection. In fact, site selection should be the decision of the villagers because they know very well the water use sources in their village. The problem is they did not perceive the pond as their own because they did not have a chance to share their ideas. This situation was the result of lack of participation in pond planning activities.

The evaluation team can conclude that development of self-reliance in the project areas needs strengthening. The project is going in the right direction; that is, having a particular village committee for fishpond management. The survey revealed that the VFP committee functioned to decide rules and regulations of pond use, sharing responsibility among committee and villagers, selecting a day for harvesting fish and setting up the price of fishing on the harvest day, and spending the collected money with respect to the committee's

desires. It is possible the villagers will realize greater self-reliance after additional harvests.

In principle, the benefits from the VFP pond should be shared as widely as possible. Several project areas set up a VFP committee instead of using an existing village committee to manage their pond. VFP committees will take responsibility for fishpond management with respect to the whole community. We found in some cases that the VFP committee was doing a good job. The benefit-sharing mechanisms which were adopted by the committee were satisfactory to the villagers.

In the VFP fishpond areas, there was limited assistance from agricultural extension or other government services, although in some cases assistance was provided by self-defense volunteer groups for a village scout training program.

5. Role of Women

Women play an important role in the agricultural sector in Northeast villages. They work in the fields similar to men and have to work on home activities as well. We found that vegetable gardening is exclusively a woman's task. She has to decide about growing the vegetables that her family consumes. Northeast women are allowed to fish but their methods are different. For example, women use a fine square net with a handle for catching fish. This tool is used effectively at the edge of a pond. Observations on harvesting day showed that about half of the villagers fishing were women.

6. Conclusions

Northeast villagers are familiar with fishing and try, whenever possible, to supplement their diet with fish caught in natural waters near the village. In general, the VFP has had only a limited effect on improving the nutrition levels in the project villages. This is so, in part, because the project has been in full operation for only about one year. Also, in terms of use of the ponds for irrigated production of gardens or orchards, as well as other uses, the villagers of the Northeast are not yet experienced in multiple-purpose uses of such ponds. They will need substantial assistance to learn how to use the ponds effectively for maximum social and economic benefits.

7. Recommendations

(a) In order to create a sense of belonging, the DOF and other agencies, starting with site selection, should plan the project in full consultation with the villagers themselves. Engineers, fishery biologists, and other government technicians should give the villagers recommendations but truly consider the needs and desires of the villagers throughout the entire planning and implementation process.

(b) The DOF Project Manager should ensure that each village fishpond committee is selected with regard to the required fishpond management activities. For example, the committee should consider the need for a manager, administrator or accountant, a person to settle conflicts, an organizer and a farm technologist. The committee should consist of a group of competent persons who can perform the above activities successfully.

(c) The DOF should ensure that the VFP committees are trained (as well as the Site Teams) with emphasis on community and self-development, and integrated farm technology. A 5-day training course for the village committees in collaboration with the Khon Kaen University is recommended.

(d) The overall concept of the project must be understood by and demonstrated to the villagers and the DOF officers by senior DOF officials before implementation.

(e) The socio-economic studies to be conducted by the Chulalongkorn University Social Research Institute (CUSRI) should focus on management and social issues that have direct application to the remainder of VFP-I and to the DOF 5-year plan and any future USAID-assisted project. (See details in Appendix L.)

VI. OBSERVATIONS AND SUGGESTIONS REGARDING A
FOLLOW-ON PROJECT

A. Introduction

This evaluation analyzes the level of accomplishment of the VFP-I. In spite of the noted design flaws, implementation delays and management difficulties, valuable lessons have been learned from the project which are applicable to any follow-on project that might be considered. For example:

1. Many villages in the Northeast truly need and would value having access to a year-round source of water. The project concept, then, to provide ponds for dry-season use by villages (presently without such a water source) for domestic purposes, fish production and other uses, is valid. It is based on important needs of the villagers.

2. The priorities of the villagers for the uses of the ponds are not necessarily the same as those of the DOF. Villagers are completely aware of their various needs and have a complex, inter-related set of priorities which can change during the year. The different views need to be considered in designing a follow-on project.

3. The VFP-I has demonstrated the underlying need for active management and supervision if this sort of project is to achieve its objectives. The management problems experienced in the VFP-I do not preclude the possibility of a successful future project, but do indicate a critical area that must be improved if such a project is to result in meaningful benefits.

4. The question of DOF's perception of the village fishpond strategy must be resolved. It is possible that with a more focused project design - one which limits its goals to the introduction of relatively simple, adapted fish-production technology, and limited construction of well-designed small ponds (if necessary and all within a reasonable time-frame) - that the DOF and USAID can find a common ground for the kind of economic development project USAID can support. The ideas outlined in the following section should be considered as the basis of such a program.

On the other hand, it is possible the DOF's views of a village fishpond project reflect a strategy with greater emphasis on social stabilization (the counter-insurgency issue) rather than on specifically-focused, economic development objectives. In this case, USAID must choose either not to support a further assistance project with the DOF, or explore the suitability of a project that could include assistance in selected areas of the DOF's five-year fishpond development program where it is agreed particular

strengthening is needed. Here, however, it should be understood whether the priority aims of the project are or are not economic development. At all costs, USAID and DOF should avoid any project which is not based upon an absolutely clear and very specific understanding of the ultimate objectives.

B. Proposed DOF/USAID Follow-on Project

1. General Design

While the VFP-I has been limited in its accomplishments, the evaluations have clearly shown that this was primarily due to inappropriate design, incorrect assumptions and a general lack of management. Thus, while this evaluation concludes that a suitable project management system for fish production development does not exist, it does indicate that there is potential to develop fish production.

The potential for developing fish production in the Northeast exists in the many water storage impoundments, as well as in rice fields and rice-paddy ponds. In particular, it appears that the culture of fish in rice-paddy ponds is reasonably well established and increasing in certain areas of the Northeast. This increase is attributed to the effect that various water storage impoundments have had on reducing the flooding and flood fisheries, which had served the purpose of providing natural fish stocks.

Therefore, as there is an upward trend in the construction of additional water storage impoundments and a related increase in the expansion of small fish farmer development, a follow-on project is recommended. DOF and USAID should collaborate (to include other donor organizations) to develop a program that would place major emphasis on assisting small fish farmers to become self-sufficient in fish production through a strengthened and expanded DOF institution.

In order for DOF to develop the capability to provide this support, the following are recommended:

(a) Organize an autonomous inland fisheries development unit to control and manage all inland fisheries development activities in the project area, for the life of the project.

(b) Re-assign intra-agency extension and engineering personnel to the development unit on a full-time basis for the life of the project.

(c) Appoint responsible management personnel to the project through re-assignment, secondment or the hiring of new personnel. Improve the management capabilities of top and mid-level management personnel through management training.

(Note: It is recommended that the establishment of the above components be a condition precedent to the implementation of a follow-on project. Also, DOF should immediately identify at least three people - one top and two mid-level - for one to three months of management training under existing VFP-I project funding.)

(d) Upgrade and expand the Fisheries Extension Section. Establish speciality teams in pond construction to support pond construction activities. Provide adequate training and support for general fisheries extension officers. Plan with MOAC to provide training and backstopping to MOAC extension officers.

(e) Upgrade knowledge base for the production of fish in ponds through an expanded research effort at NIFI and regional centers.

(f) Upgrade and expand fingerling production capability.

(g) Upgrade and expand in-house (institutional) training component. Develop training programs for small farmers, commercial farm managers, MOAC extension officers and professional fisheries personnel, in fish production techniques.

(h) Upgrade in-country fish culture and fisheries extension training, with emphasis upon introducing appropriate courses at regional universities through training of university staff or the seconding of NIFI and Kasatesart University staff, and placing more emphasis on applied fish culture training.

In addition to supporting the strengthening and expansion of the DOF institution, it is assumed that the RTG would ensure that credit and fertilizers (NPK) would be available in adequate quantity to support the planned fish production program. Likewise, USAID (or other donor agencies) should guarantee project support through grant and loan funds for the following inputs:

2. Technical Assistance

(a) Short-term support to assist DOF in designing and planning the new project. Suggested team should include:

Recommended US Components

- Two US Aquaculturists, with broad training and experience in aquaculture planning, development, production, management and administration (two to three months).
- USAID Engineer (four to six weeks).
- USAID Translator (two to three months).

Recommended Thai Components

- DOF mid-level Aquaculturist (two to three months).
- DOF mid-level Administrator (two to three months).
- Sociologist (two to three months).

(b) Long-term support to assist DOF in the coordination and implementation of the program to include:

- One senior Technical Advisor (TA) with a broad background in fish production and experience in implementation and management for the life of the project.
- Two TAs with general fish production training and experience for the life of the project.
- Peace Corps Volunteers (PCVs) to serve as counterparts to fisheries extension officers. PCVs should have a B.S. degree in Fisheries Biology (or B.S. degree in Biology with a fisheries major) and receive short-term training in applied fish culture at a U.S. university (University of Oklahoma or Auburn University both have established programs for training PCVs) and in-country fisheries orientation through the DOF. PCV support should be for the life of the project.

(c) Short-term TA support of two person-months per project year to provide any specialty support needed.

3. Commodities

(a) Laboratory, fish handling, shop and surveying equipment, and reference books for the fisheries stations, extension teams and Khon Kaen University.

(b) Light pond construction equipment for three regional units (teams) consisting of:

- two D-4 dozers
- one truck and trailer
- recommended spare parts for duration of project

(c) Transportation to support extension activities:

- small pickups (two per province)
- motorcycles (125cc or less - 12 per province)

4. Training

(a) Short-term (4 to 6 months) practical overseas training in applied fish production technology, management and extension methods.

(b) Overseas degree training (M.S. in Fish Culture) for two staff members of Khon Kaen University.

(c) Overseas degree training (M.S. in Fish Culture) for two to three DOF professional staff to serve in mid or regional-level positions in the Northeast.

5. Conclusions

As a project concept, then, the village fish production system appears to be valid. In particular, a broader VFP concept to separate the need for domestic water from the need for aqua-agriculture water use would appear to be a more appropriate design and could be accomplished by the following:

- Construction of a pond specifically for domestic purposes.
- Construction of one or more village nursery ponds.
- Construction of small satellite fish production ponds on individual farmer holdings.

While it can be argued that the development of fish production in the Northeast should be limited to extensive, low-management fish production, a better argument would be that initial development should be limited to an extensive practice. As the income base and management capability improves through increased production it could be expected that yields could be increased beyond the extensive level, assuming inputs were available. The new project would promote development at both the village and individual farmer level. Most importantly, it would serve to identify the more aggressive and capable farmers and thus establish the base for demonstrating higher yields through increased management and inputs.

In order to ensure that the new project is implemented on a timely basis and that it reaches all of the planned achievements it will be necessary that support be guaranteed for all phases of development. In particular, it is recommended that the project provide DOF with light pond construction equipment (D-4 type dozers with truck-trailer transport) for the purpose of constructing small ponds for individual farmers (it is recommended that DOF coordinate

or contract with other RTG agencies, or the private sector, for the construction of the larger domestic purpose ponds). In addition, the RTG should guarantee the availability of NPK fertilizer.

As the development of institutional capability is a key factor for the implementation and management of a follow-on project, it is recommended that major project progress be limited to the development of such capability in the initial year. In order to allow sufficient time for the development of institutional capability and a significant level of project development (ponds constructed, farmers trained and fish produced) it is recommended that the follow-on project be, at minimum, for a period of seven years.

The major outputs expected from the new project would be:

- a strengthening and expansion of the DOF Inland Fisheries Institution (with upgraded and expanded hatchery/demonstration facilities, established in-country training programs and expanded fisheries extension capabilities).
- the establishment of a significant number of small farmers trained to be self-sufficient in fish production (21 kgs/person/year).
- an expanded private sector program of production at the commercial level, producing fingerlings to support expanded fish culture activities of the small farmer and food fish for urban consumption needs.

VII. APPENDICES

SCOPE OF WORK

Department of State

APPENDIX A

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ACTION OFFICE ASCP-F4
INFO AARS-01 ASEN-01 ASPT-02 CH6-01 PPCE-01 PDPR-01 PPPB-03
PPEA-01 FM-02 ASPB-03 ASTH-01 AADS-01 DSAG-02 DSHE-01
OSH-03 DSPB-03 SSFO-02 ENGR-02 CH8-01 AGRI-01 BELD-01
DAEN-01 HAST-01 00-01 /030 A1 721

TECHNICIANS SHOULD NOT BE ASSOCIATED WITH DEPARTMENT OF FISHERIES. DTIC WILL ALSO BE INVITED TO PARTICIPATE IN THE EVALUATION AS WELL AS OTHER APPROPRIATE RTG OFFICES AS NEEDED. MISSION NUTRITION OFFICER AND RTG COUNTERPARTS WILL ALSO PROVIDE INPUT.

INFO OCT-01 EA-12 SSO-00 /048 V
-----052215 210517Z /11

4. TIMING: THE EVALUATION IS SCHEDULED TO COMMENCE ON OR ABOUT APRIL 1, 1981 AND CONTINUE FOR A SIX TO SEVEN WEEK PERIOD.

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FM AMEMBASSY BANGKOK
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5. METHODOLOGY:

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A. THE US TECHNICIANS WILL BE EXPECTED TO SPEND AT LEAST TWO WORKING DAYS IN AID/W FAMILIARIZING THEMSELVES WITH THE PROJECT. THIS WILL INCLUDE DISCUSSIONS WITH INDIVIDUALS HAVING GENERAL EXPERIENCE IN THAILAND, FISHERIES BACKGROUNDS (PREFERABLY IN THAILAND), AND RURAL DEVELOPMENT EXPERIENCES IN THAILAND. THESE INDIVIDUALS COULD INCLUDE BUT NOT BE LIMITED TO: TOM COOPER, QUAYNE HAMMER, DAVE LUMBERG, AND REN OSBORNE. THIS FAMILIARIZATION WILL ALSO INCLUDE READING DOCUMENTS RELATED TO THE PROJECT AS MADE AVAILABLE IN AID/W.

AIDAC

FOR MAUREEN HORTON, ASIA/DP

B. THE THAI TECHNICIANS WILL BE EXPECTED TO SPEND THREE WORKING DAYS, PRIOR TO THE ARRIVAL OF THE US TECHNICIANS, FAMILIARIZING THEMSELVES WITH THE PROJECT. THIS WILL INCLUDE READING AVAILABLE DOCUMENTATION AS PROVIDED BY USAID AID 00F, MEETING INDIVIDUALS RELATED TO PROJECT ACTIVITIES, REVIEWING THE SCHEDULE, AND ARRANGING FOR MEETINGS AND TRAVEL.

EO 12065: NA
SUBJECT: VILLAGE FISH PONDS PROJECT: SCOPE OF WORK FOR EVALUATION

C. AFTER ARRIVAL IN THAILAND AND ASSEMBLING OF THE WHOLE TEAM IN BANGKOK, THREE WORK DAYS WILL BE SPENT IN DISCUSSIONS, MEETINGS, AND ADDITIONAL FAMILIARIZATION RE THE PROJECT, EVALUATION SCOPE OF WORK, AND OBJECTIVES OF EVALUATION.

1. THE PROJECT: THE USAID VILLAGE FISH POND DEVELOPMENT PROJECT GRANT NUMBER 493-0303 PROVIDED FUNDING FOR \$42,000 TO ASSIST THE RTG IN FINANCING COSTS OF WATER STORAGE TANK DEVELOPMENT, TECHNICAL ASSISTANCE, TRAINING, OPERATIONAL RESEARCH, AND EVALUATION. THESE FUNDS COVER A TWO YEAR PERIOD FROM THE DATE OF AUTHORIZATION (SEPTEMBER 1979). THE PURPOSE OF THE PROJECT IS TO PROVIDE SELECTED DISADVANTAGED RURAL COMMUNITIES IN THE NORTHEAST WITH YEAR ROUND ACCESS TO SUPPLEMENTAL WATER SUPPLIES AND FISH PROTEIN THROUGH TECHNIQUES WHICH CAN BE READILY REPLICATED IN THE NORTHEAST. WHILE THE DEGREE OF VILLAGER ACCEPTANCE THUS FAR APPEARS TO BE QUITE HIGH, THERE REMAIN NUMEROUS AREAS OF UNCERTAINTY WITH REGARD TO VILLAGE MANAGEMENT CAPABILITY, ECONOMIC/NUTRITIONAL BENEFITS TO VILLAGERS, PROJECT SUPERVISION, AND ALTERNATIVE OR INTENSIVE USE OF THE POND/WATER RESOURCE. PROJECT ASSISTANCE COMPLETION DATE IS DECEMBER 31, 1981.

D. THREE WEEKS WILL BE SPENT IN THE NORTHEAST, VISITING ALL PONDS AND OTHER RELEVANT LOCATIONS, AND GATHERING

2. PURPOSE OF THE EVALUATION: THE PURPOSES OF THE EVALUATION ARE AS FOLLOWS:

A. TO DETERMINE APPROPRIATE MEASURES TO BE UNDERTAKEN BY DDF AND USAID TO INCREASE EFFECTIVENESS AND EFFICIENCY IN RELATION TO SPECIFIC GOALS AND OBJECTIVES OF THE PROJECT;

B. TO DETERMINE IF PONDS AT THE VILLAGE LEVEL CAN BE SUCCESSFULLY MANAGED BY VILLAGERS AND DDF SO THAT ECONOMIC, SOCIAL, AND NUTRITIONAL BENEFITS ACCRUE TO THE VILLAGERS;

C. TO ASSESS DATA GATHERING ACTIVITIES TO DETERMINE NEEDS FOR PROJECT REPLICATION,

D. TO SUGGEST A FRAMEWORK WITHIN WHICH A FOLLOW-ON PROJECT CAN BE DESIGNED FOR IMPLEMENTATION IN FY 82.

3. TEAM COMPOSITION: THE EVALUATION TEAM WILL CONSIST OF SIX PERSONS - AGRICULTURAL ECONOMIST, US, TEAM LEADER; FISH BIOLOGIST/AQUACULTURIST, US; AGRICULTURAL ECONOMIST, THAI; SOCIAL SCIENTIST, THAI; FISH BIOLOGIST/AQUACULTURIST, THAI; CONSTRUCTION ENGINEER/WATER RESOURCES ENGINEER, THAI. RESULTING FROM LONG ASSOCIATION WITH AUBURN UNIVERSITY, IT IS PROPOSED THAT THE US TECHNICIANS NOT BE ASSOCIATED WITH THAT UNIVERSITY. THAI

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INCOMING TELEGRAM

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ACTION A10-35

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ACTION OFFICE **ASDP-02**
INFO AAAS-01 ASHM-01 ASPT-02 CNG-01 PPCE-01 PDPH-01 PPPD-03
PPLA-01 FM-02 ASPD-03 ASTR-01 AAOB-01 BSAG-02 BSNE-01
BSN-03 BSPD-03 BCRD-02 ENCR-02 CNG-01 AGR1-01 HELD-01
BAER-01 MAST-01 00-01 /039 A1 721

INFO OCT-01 EA-12 830-00 /048 M
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DATA AND INFORMATION RELEVANT TO ISSUES BEING ADDRESSED IN THE EVALUATION. IT MAY BE NECESSARY FOR ALL OR PART OF THE TEAM TO RETURN TO BANGKOK FOR UP TO THREE DAYS DURING THAT PERIOD TO GATHER ADDITIONAL INFORMATION, CLARIFY CERTAIN ISSUES, OR PRESENT PRELIMINARY FINDINGS.

E. FOLLOWING THE FIELD WORK, THE TEAM WILL SPEND TWO WEEKS IN BANGKOK FINALIZING THEIR FINDINGS AND PREPARING A DRAFT EVALUATION REPORT. THIS DRAFT WILL BE CIRCULATED TO CONCERNED DDF AND USAID OFFICIALS TWO DAYS PRIOR TO THE END OF THE TWO WEEK PERIOD. THE REPORT WILL THEN BE DISCUSSED AT A FINAL MEETING TO BE HELD AT THE END OF THE TWO WEEK PERIOD. FOLLOWING THIS, IN THE REMAINING TWO DAYS OF THE EVALUATION PERIOD, ANY OUTSTANDING ISSUES OR POINTS IN THE REPORT CAN BE CLARIFIED.

F. THE REPORT WILL BE PUT INTO FINAL FORM, BY THE US TEAM LEADER AND THE LEADER OF THE THAI GROUP. THIS WILL BE COMPLETED IN BANGKOK DURING THE FINAL WEEK OF THE EVALUATION.

G. THE EVALUATION REPORT SHOULD CONTAIN SPECIFIC RECOMMENDATIONS WHICH ADDRESS THE VARIOUS QUESTIONS AND ISSUES POSED IN THE SCOPE OF WORK.

H. MAJOR QUESTIONS TO BE ANSWERED: FOR EACH FACTOR OUTLINED BELOW, THE EVALUATION TEAM WILL ASSESS CURRENT EXPERIENCE/ACTIVITIES AND MAKE RECOMMENDATIONS FOR MORE EFFECTIVE TECHNICAL/ADMINISTRATIVE ARRANGEMENTS IN THE FUTURE:

MANAGEMENT.

A. ARE THE INDIVIDUAL VILLAGES - COMMITTEES AND RESIDENTS - CAPABLE AND WILLING TO MANAGE THE PONDS SO THAT:

- I. OUTPUT (FISH) IS MAXIMIZED GIVEN EXISTING RESOURCES;
- II. THERE IS REASONABLE EQUITY OF DISTRIBUTION OF OUTPUT AND BENEFITS (FISH AND WATER) TO PRECLUDE CONFLICT FROM EXCESS DEMANDS;
- III. SOURCES OF ASSISTANCE ARE KNOWN AND SOUGHT OUT WHEN PROBLEMS ARISE; AND
- IV. ALTERNATIVE USES OF WATER RESOURCES ARE KNOWN AND EFFECTIVELY EXPLOITED WITHIN THE FRAMEWORK OF A), B), AND C) ABOVE?

THIS INCLUDES USES OTHER THAN FOR FISH PRODUCTION, TO INCLUDE SMALL ANIMAL HUSBANDRY, HORTICULTURE, PUBLIC WATER SYSTEMS, ETC.

D. IS THE STAFF AND ORGANIZATION OF THE DDF, AS IT RELATES TO VILLAGE FISH POND DEVELOPMENT, CAPABLE OF EFFECTIVELY PROMOTING AND SUPPORTING AQUACULTURE PRACTICES AT THE VILLAGE LEVEL SO THAT:

I. VILLAGERS ARE ADEQUATELY FAMILIARIZED WITH IMPROVED FISHERY MANAGEMENT TECHNIQUES;

II. THERE ARE ADEQUATE SUPPLIES OF FINGERLINGS;

III. APPLIED RESEARCH IS CONDUCTED TO ENABLE MID-COURSE ADJUSTMENTS OR IMPROVEMENTS;

IV. COMMUNICATIONS AND COORDINATION FACILITATE A USEFUL EXCHANGE AND FLOW OF MANAGEMENT TYPE INFORMATION;

V. ADEQUATE TECHNICAL EXPERTISE IS AVAILABLE WHEN NEEDED TO SOLVE PROBLEMS OR MAKE RECOMMENDATIONS FOR MORE EFFECTIVE UTILIZATION OF THE WATER RESOURCE.

C. IS THE EXISTING CAPABILITY OF DDF SUFFICIENT TO SUPPORT AN EXPANSION OF THE VFP CONCEPT?

D. CAN A PROJECT MANAGEMENT MONITORING AND REPORTING SYSTEM, SUITABLE FOR RTG AND USAID PROJECT OFFICERS, BE INSTALLED AND WHAT FORM SHOULD IT TAKE?

TECHNICAL ASPECTS.

A. WERE THE ASSUMPTIONS IN THE PP REALISTIC WITH REGARD TO EXPECTED OUTPUT FROM EACH POND (KILOS OF FISH PER HAI) BASED ON NATURAL WATER QUALITY, THE ESTIMATED INPUT RESOURCES AVAILABLE (NAMELY LOCAL NUTRIENTS AND PURCHASED FERTILIZER), AND AQUACULTURE TECHNIQUES THAT CAN BE

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PATING VILLAGERS. HOW CAN THE FISH MANAGEMENT/AGRICULTURAL REGIME BE MANAGED TO OPTIMIZE NUTRITIONAL BENEFITS? WHAT OTHER ACTIVITIES WOULD INCREASE THE NUTRITIONAL BENEFITS?

ACTION OFFICE ASDP-02 INFO AAAS-01 ASEM-01 ASPT-02 CHG-01 PPCE-01 POPR-01 PPPD-03 PPA-01 FM-02 ASPD-03 ASTR-01 AADS-01 DSAG-02 OSHE-01 OSN-03 DSPD-03 OSRD-02 ENGR-02 CHG-01 AGR1-01 RELO-01 OAJN-01 NAST-01 DO-01 /030 AI 721

INFO OCT-01, EA-12 SSO-00 /040 W -----052243 210524Z /11

3 210450Z MAR 81 FM AMEMBASSY BANGKOK TO SECSTATE WASHDC IMMEDIATE 5029

UNCLAS SECTION 03 OF 03 BANGKOK 15687

BTAC

FOR MAUREEN HORTON, ASIA/DP

READILY ADOPTED BY FARMERS? ARE THESE INPUTS ACTUALLY AVAILABLE? THIS ISSUE ALSO ADDRESSES THE QUESTION OF FREQUENCY OF OFFTAKE (ONCE A YEAR VERSUS MORE FREQUENT FISHING INTERVALS).

B. IS THERE REASON TO EXPECT THAT THIS INPUT RESOURCE BASE CAN BE IMPROVED, EXPANDED, OR AUGMENTED UNDER EXISTING CONDITIONS TO INCREASE FISH POPULATIONS/OUTPUT FROM THE PONDS? THIS QUESTION APPLIES NOT ONLY TO THE NATURAL RESOURCES IN THE ENVIRONS OF EACH POND, BUT ALSO TO THE TECHNICAL AND RESEARCH CAPABILITY OF BOF TO TEACH AND MANAGE NEEDED IMPROVEMENTS.

ECONOMIC RETURNS TO FISH PONDS.

A. ON THE BASIS OF CURRENT EXPERIENCE, WHAT ARE REASONABLE EXPECTATIONS CONCERNING ECONOMIC RETURNS TO FISH PONDS FROM FISH PRODUCTION ALONE? WHAT ADDITIONAL ECONOMIC BENEFITS CAN BE REALIZED FROM OTHER USES OF POND WATER, INCLUDING DOMESTIC WATER, HORTICULTURE, ANIMAL HUSBANDRY?

B. WHAT SPECIFIC ACTIVITIES MIGHT BE INTRODUCED TO PROMOTE ADDITIONAL BENEFITS FROM OTHER POND USES SUCH AS HORTICULTURE, ANIMAL HUSBANDRY? THIS MUST BE CONSIDERED IN LIGHT OF EXISTING POND CAPABILITY, FARMER PREFERENCE AND TECHNICAL EXPERTISE.

C. WHAT COMPARISONS CAN BE MADE WITH PRIVATE SECTOR PONDS IN ECONOMIC TERMS? ARE THERE ANY SIGNIFICANT FACTORS IN PRIVATE OPERATIONS WHICH COULD BE TRANSFERRED TO THE BENEFIT OF THE VILLAGE PONDS. THESE FACTORS INCLUDE MANAGEMENT, PRODUCTION, AND CONSTRUCTION AMONG OTHERS.

SOCIAL BENEFITS FROM FISH PONDS.

A. ARE THE PURELY SOCIAL BENEFITS PERCEIVED OR ACTUALLY REALIZED BY THE VILLAGERS ADEQUATE TO SATISFY THEIR DESIRES OR NEEDS FROM THE POND? THESE BENEFITS WOULD INCLUDE WATER FOR DOMESTIC USE, USE BY WATER BUFFALO OR OTHER LIVESTOCK, INCREASES IN THE GENERAL WATER TABLE LEVEL AROUND THE VILLAGE, ETC. THESE BENEFITS ARE PARTICULARLY IMPORTANT DURING THE DRY SEASON.

B. IS THERE ANY INCREASED INCENTIVE TO MANAGE THE PONDS BASED ON VILLAGERS PERCEPTION THAT THE POND IS ACTUALLY THREAT?

C. WHAT ARE PROBABLE NUTRITIONAL BENEFITS TO PARTICI-

CONSTRUCTION.

A. ARE THERE ADEQUATE AND SUFFICIENT CONSTRUCTION COMPANIES TO BUILD THE ADDITIONAL NEW PONDS ENVISIONED IN A FOLLOW-UP PROJECT? THIS IMPLIES THAT THE CONSTRUCTION COMPANIES MUST HAVE THE REQUIRED PIECES OF EQUIPMENT AND ENGINEER STAFF CAPABILITY TO MEET POND SPECIFICATIONS.

B. IS THERE ADEQUATE ENGINEERING DESIGN AND SUPERVISORY CAPABILITY WITHIN THE RTG, INCLUDING BOF, OTHER CENTRAL DEPARTMENTS AND PROVINCIAL ADMINISTRATIONS TO OVERSEE THE CONSTRUCTION OF PONDS TO ENSURE THAT THEY MEET THE REQUIREMENTS OF THE PROJECT.

C. AN ASSESSMENT SHOULD BE MADE OF PONDS CONSTRUCTED UNDER VFP I IN AN ATTEMPT TO DETERMINE THEIR ADEQUACY AS VILLAGE WATER RESOURCES AND AS FISH PONDS. THIS ASSESSMENT SHOULD ADDRESS QUESTIONS REGARDING APPROPRIATENESS OF DESIGN, LEAST COST CONSIDERATIONS, WATERSHED CATCHMENT AREA, WATER HOLDING CAPACITY, POTENTIAL DETERIORATION, AND MAINTENANCE REQUIREMENTS.

7. YOUR EXPEDITIOUS REVIEW OF THIS SCOPE OF WORK AND ALLOTMENT OF PDS FUNDS WILL BE GREATLY APPRECIATED. AS YOU ARE AWARE, WE HAVE SCHEDULED THE START OF THE EVALUATION FOR 8/A APRIL 1, 1981. WE ARE STILL AWAITING SOME SUGGESTIONS FOR CANDIDATES. WHILE REALIZING THAT TIME IS GETTING SHORT, WE CANNOT AFFORD TO DELAY MUCH BEYOND APRIL 15 AS WE WILL RUN INTO THE RAINY SEASON IN MID-MAY. THEREFORE, YOUR EXPEDITIOUS HANDLING OF THIS MATTER WILL BE GREATLY APPRECIATED. ABRAMOVITZ

THE EVALUATION METHODOLOGY AND RECOMMENDATIONS

The VFP evaluation team, made up of seven Thai and two American members, assembled in Bangkok during the first three weeks of May. They held several preliminary meetings to discuss the scope of work, the responsibilities of the various team members, and the survey techniques to be used in the field. A village survey form was developed by the team and used as a basic guide in gathering data about the project. (The form used is included as Appendix D.) They also reviewed project documentation, and met with appropriate USAID and DOF/NIFI officials associated with the project to get their thoughts and expectations of the evaluation.

The entire team assembled and left for a 12-day field trip on May 25. They visited 10 of the 14 project ponds, which was an adequate sampling of the project sites, and returned to Bangkok on June 5. (Two team members visited one of the other ponds at a later date where they attended a fish harvest.) The field trip schedule is included as Appendix E.

In each village, the team was accompanied by the responsible Provincial DOF staff, including the Chief of the Fisheries Station and the Site Team members. The team divided into four working groups for data gathering: Management/Economic, Social, Construction and Aquaculture. They interviewed the village headmen, the village committees, the Site Teams and a cross sampling of villagers, as appropriate to each area of investigation. Members of the team also visited four Provincial Fisheries Stations, several private fish farms and local construction contractors to get additional project data. Members of the team also met informally with the Border Patrol Command in Khon Kaen and the Rector of Khon Kaen University. Meetings were held in the field of the separate working groups and the entire team to discuss findings and share ideas.

A draft copy of the final evaluation report was provided to USAID and DOF on June 18, followed by presentation of the major conclusions and recommendations on June 22 at a joint DOF/USAID meeting at NIFI. The report was finalized and presented to USAID on June 25. The American members of the evaluation team departed Bangkok on June 26.

A few lessons can be learned from this assignment that should help to make future evaluations more effective. First, an evaluation team as large and diverse as this one is unnecessary, particularly in view of the small size and relative lack of complexity in this two-year pilot project. The lack of previous evaluation experience of some team members further complicated the assignment. Moving from basic data-gathering by individual team members to a unified analysis and set of conclusions and recommendations--generally supported and agreed to by the entire team--is extremely difficult under these circumstances.

The inclusion on the evaluation team (as official members and not as observers) of three representatives of government agencies (Department of Technical and Economic Cooperation-DTEC, The Bureau of the Budget-BOB and the National Economic and Social Development Board-NESDB) could at least open the door to questions concerning their objectivity. The assignment of government officials to evaluate a project managed and implemented by another agency places these individuals in a difficult position and should, as a general rule, be avoided.

PERSONS INTERVIEWED

1. Gail Heston, Evaluations/Asia, AID/W
2. Maureen Norton, Evaluations/Asia, AID/W
3. Barbara Pillsbury, Chief, Evaluations/Asia, AID/W
4. A. David Lundberg, Chief, ASIA/TR/ARD, AID/W
5. Kenneth Osborn, DS/AGR, AID/W
6. Michael Cremer, Fisheries Specialist, Auburn University
7. Robert Ressequie, Project Officer, USAID/T
8. Det Trisahd, Program Specialist, USAID/T
9. David Bathrick, Agric. Officer, USAID/T
10. Plodprasop Suraswadi, Project Director, DOF/NIFI
11. Kumron Potipitak, Project Manager, DOF/NIFI
12. Alex Fedoruk, Fisheries Consultant to DOF/NIFI
13. Donald Cohen, Mission Director, USAID/T
14. Robert Queener, Deputy Mission Director, USAID/T
15. Khemchart Nimsomboon, Chief Sakon Nakhon Fishery Station
16. Prachuap Photong, Acting Chief Udon Thani Fishery Station
17. Pratom Taweesak, Chief Khon Kaen Fishery Station
18. Chaiwat Panprommin, Chief Korat Fishery Station
19. Sub-district Headmen, Village Headmen, Village Committees, and Villagers in 10 VFP Project Locations
20. Police Major General Wipas Wipulakorn, Commanding General Region 2 (Northeast), Border Patrol Police, Khon Kaen
21. Professor Krawi Tangsubutr, MD, Rector Khon Kaen University
22. Chalerm Ratanatrisri, Contractor, Udon Thani
23. Sathit Sikha, Chief Engineering Section, DFF/DOF
24. Anusorn Ritthakawee, NIFI

VILLAGE SURVEY FORM USED

Pond: _____

Date: _____

Interviewer: _____

Persons Interviewed: _____

I. CONSTRUCTION

1. Pond Completed: Yes ___ date _____; No ___ % completed _____ %

2. Pond Area As Designed: _____ rai

3. Pond Water Volume As Designed: _____ m³

4. Pond Water Volume At Present Time: _____ m³

5. Estimated Construction Cost: _____ Baht

6. Actual Construction Cost: _____ Baht

7. Specific Pond Characteristics:

a. Is embankment excessively high _____; wide _____; long _____

b. Is embankment slope too steep to allow easy access and maintenance, _____

c. Is embankment protected with grass cover, _____

d. Is there core trench in embankment, _____

e. Are needed embankment areas missing, _____

f. Is there a discharge conduit in embankment, _____

g. Is embankment soil clay content above 20%, _____

h. Is there evidence of seepage, _____; is it serious, _____

i. Is spillway height too low for maximum water storage, _____

j. Is spillway well designed and located, _____

k. Is there a drawdown conduit in spillway, _____

l. Is water depth sufficient to prevent weed growth, _____

m. Are there sufficient water inlets, _____

n. Are water inlets well placed, _____

o. Are water inlets screened, _____

p. Are water outlets screened, _____

q. Is pond bottom level, _____

r. Are pond edges too shallow, _____

s. Has there been any sub-grades excavation, _____

t. Is pond well maintained; weed free, _____

u. Is watershed area sufficient to maintain pond water level, _____

v. Does pond cause any nearby flooding, _____

8. Are Nursery Ponds Constructed, _____

9. Is Construction Of Nursery Ponds Adequate, _____

Pond: _____

Date: _____

Interviewer: _____

Person Interviewed: _____

II. SOCIAL BENEFITS

1. Number of People In Community Served By Pond; _____ people
2. Number of People Actually Realizing Benefits From Pond, In Terms Of:
 - a. increased consumption of fish; _____ people; _____ kg/person increase
 - b. year-round access to domestic water; _____ people
 - c. easier access to domestic water; _____ people
 - d. water for livestock; _____ families
 - e. earlier planting of rice seedbeds; _____ families; _____ rai-seedbeds
 - f. increased planting/growing of orchards and gardens; _____ families
_____ rai
 - g. increase in water table (improved wells); _____ families
 - h. decreased level of underemployment; _____ people better employed
 - i. decreased emigration from area; _____ %, estimated decrease
 - j. other; (list)
3. Are Villagers Willing to Cooperate In Order To:
 - a. construct nursery fish ponds; yes _____; no _____
 - b. produce seed fish in nursery ponds; yes _____; no _____
 - c. sod the pond embankment; yes _____; no _____
 - d. remove weeds from pond; yes _____; no _____
 - e. remove sedimentation from pond; yes _____; no _____
 - f. repair/maintain embankment; yes _____; no _____
 - g. follow established regulations for pond use; yes _____; no _____
4. What Percentage Of Villager Participate In Pond Activities; _____ %
5. Are Villagers Included In Decision-making Process; yes _____; no _____
6. How Is Relationship Between Villagers And Site Team (DOF);
good _____; fair _____; poor _____
7. What Pond Management System Used:
 - a. committee; yes _____; how selected: _____
 - b. temple-assisted; yes _____
 - c. "bidding system"; yes _____
 - d. other (list) _____

SOCIAL BENEFITS

8. What Benefit-sharing Mechanisms Have Been Tried In Village:
 - a.
 - b.
 - c.
9. Do Villagers Want Pond Management Training; yes _____; no _____
10. Have Villagers Received Any Training; yes _____; no _____
 - a. subjects _____
 - b. number of days: _____
 - c. number of people received training: _____
 - d. location of training: _____
11. Are Villagers Learning Self-reliance: yes _____; no _____
12. Do Villagers Perceive Pond As Their Own:
 - a. yes _____; reasons _____
 - b. no _____; reasons _____
13. Is Pond Accessable To Other Villages As Demonstration: yes _____; no _____
14. What Use Is Made Of Harvested Fish:
 - a. fresh consumption
 - b. fish sauce
 - c. dried fish
 - d. marketed _____ price received _____ Baht/kg.
15. How Has This Project Affected The Role Of Women
 - a. unchanged _____
 - b. improved _____; how _____
 - c. deteriorated _____; how _____
16. What Are Average Dietary Protein Consumption Levels In the Village:
 - a. fish: _____ kg/person/year
 - b. other complete (animal) protein foods: _____ kgs/person/year
 - c. vegetable protein (legumes): _____ kg/person/year
17. Has The Village Constructed A Comunity Shelter-building Near The Pond For Meetings/Activities:
 - a. Yes _____
 - b. No _____; reasons: _____

Pond: _____ Date: _____

Interviewer: _____ Persons Interviewed: _____

III. Aquaculture Technology: _____

1. Is Pond Completed And Ready For Fish Production: Yes _____ No _____

2. If Ready, Is A Fish Production Management Plan Prepared: Yes _____ No _____

3. Has Pond Ever Been Stocked:

a. No _____

b. Yes _____: date _____; Tilapia; _____ per rai of _____ cm. each

date _____; puntius; _____ per rai of _____ cm. each

date _____; rohu; _____ per rai of _____ cm. each

date _____; bighead carp; _____ per rai of _____ cm. each

4. Estimated Natural Fish Mortality:

a. in first 30 days after stocking: _____ %

b. per month after first 30 days: _____ %

5. Water Level of Pond:

a. at time of survey: _____ rai or _____ % of capacity

b. expected at end of dry season (April): _____ rai or _____ % of capacity

6. Average Weight of Fish:

a. Tilapia, _____ gr. at 90 days: _____ gr. at 150 days: _____ gr. at 240 days

b. puntius, _____ gr. at 90 days: _____ gr. at 150 days: _____ gr. at 240 days

c. rohu, _____ gr. at 90 days: _____ gr. at 150 days: _____ gr. at 240 days

d. bighead carp, _____ gr. at 90 days; _____ gr. at 150 days: _____ gr. at 210 da

7. Are adequate Inputs Available:

a. Seed fish: Yes _____; No _____; Source of seed fish: _____

b. manure: Yes _____; No _____

c. fertilizer: Yes _____; No _____

d. lime: Yes _____; No _____

e. nets: Yes _____; No _____

f. pumps: Yes _____; No _____

g. other (list)

Aquaculture Technology (Continued)

8. Aquaculture Management Techniques Practiced:

- a. controlled stocking: Yes _____ No _____; schedule: _____
- b. polyculture: Yes _____ No _____; what species: _____
- c. regulation of harvest: Yes _____; No _____; what method _____
- d. removal of wild fish: Yes _____; No _____; how often _____
- e. application of manure: Yes _____; No _____; amount _____ kg/rai per _____
- f. application of lime: Yes _____; No _____; not needed _____
- g. removal of vegetation: Yes _____; No _____; frequency _____
- h. removal of sediment: Yes _____; No _____; frequency _____
- i. drying of pond bottom: Yes _____; No _____; frequency _____

9. How Often Are Fish Harvested: _____ per _____

10. Are Villagers Using Composting Pits to Produce Manure/Wastes Slurry: No _____ Yes _____

11. Is Pond DOF Site Team Present: Yes _____; No _____

12. If Present:

- a. list members: _____, _____, _____
- b. no of days team spent in village since assigned: _____ days

13. Fish Nursery Ponds:

- a. completed: Yes _____; No _____
- b. functioning: Yes _____ No _____
- c. seed fish produced: _____ of _____ species

Pond: _____ Date: _____

Interviewer: _____ Persons Interviewed: _____

IV. Management

A. Village Capabilities

1. Is There A Functioning VFP Community Committee:

a. Yes _____; members _____
; frequency of meetings: _____ times per _____

b. No _____; reasons why not: _____

2. Has The Community Committee Been Involved In:

a. determining pond operational plan: Yes _____ No _____

b. setting pond use policies: Yes _____ No _____

c. determining regulations: Yes _____ No _____

d. supervising pond management: Yes _____ No _____

e. keeping records on inputs/outputs of pond: Yes _____ No _____

f. determining distribution of benefits: Yes _____ No _____

g. getting fish nursery pond built: Yes _____ No _____

h. establishing improved practices, such as:

(1) sodding of embankment: Yes _____ No _____

(2) adding manure to pond: Yes _____ No _____; kgs. per _____

(3) controlling use of pesticides/herbicides in area: Yes _____ No _____

(4) removing excess or predator fish: Yes _____ No _____

(5) removing weeds: Yes _____ No _____

(6) applying lime: Yes _____ No _____

(7) removing sediment: Yes _____ No _____

(8) periodical drying of pond: Yes _____ No _____

(9) repairing/maintaining embankment: Yes _____ No _____

3. Percentage of Land Adjacent To Pond Private _____%; Public _____%

4. Amount of Land Adjacent To Pond Brought Under Cultivation

Since Pond Completed: _____ rai

5. Do Villagers Feel Capable Of Managing Pond To Get Maximum Fish:

a. Yes _____

b. No _____; why not _____

6. Are Villagers Interested In Using Pond For Alternative Purposes:

a. Yes _____; what other purposes _____

b. No _____; why not _____

7. What Sources Of Assistance For Problems Do Villagers Know And Use:

Know About (List); Receive Help From (Circle)

for a. fisheries _____

b. livestock _____

c. horticulture _____

d. rice production _____

e. domestic water _____

f. other (list) _____

8. What Training Received By Villagers:

	where	when	length	Number of people
for a. fisheries				
b. livestock				
c. cropping				
d. other(list)				

9. Economic Inputs (Costs)

- a. value of pond site land: _____ rai at _____ baht per rai
- b. planning and design costs: _____ baht
- c. cost of pond construction: _____ baht
- d. cost of nursery pond construction: _____ baht
- e. fish nursery equipment provided (or to be provided):
 - (1) types
 - (2) costs each
- f. harvesting equipment provided (or to be provided):
 - (1) types
 - (2) costs each
- g. Professional Staff Costs
 - (1) site team: three people for 75 days each
 - (2) DOF management
 - (3) transportation
- h. Training Costs
 - (1) site team
 - (2) villagers
- i. Seed fish provided (or to be provided) in annual cycle
 - (1) number of seedfish _____
 - (2) cost per 1000: _____ baht
- j. Annual operating and maintenance costs
 - (1) types
 - (2) costs
- k. Annual equipment depreciation and replacement costs: _____ baht
- l. Contingency costs.

10. Economic Outputs (Benefits)

a. wages paid to villagers in construction of pond: _____ baht

b. fish yields (annual cycle)

(1) tilapia; _____ kg. at _____ baht per kg.

(2) puntius; _____ kg. at _____ baht per kg.

(3) rohu ; _____ kg. at _____ baht per kg.

(4) bighead carp; _____ kg. at _____ baht per kg.

c. household water

(1) number of households using pond for domestic water: _____ families

(2) number of days during dry season water available: _____ days

(3) estimated value: _____ baht per family per day.

d. livestock water

(1) number of families using pond for livestock water: _____ families

(2) number of livestock (bovine equivalent) per family:
_____ animals (b.e.)

(3) number of days during dry season water available: _____ days

(4) estimated value: _____ baht per bovine equivalent per day.

e. gardens and orchards

(1) number of families using pond for gardens or
orchards: _____ families

(2) average size of garden watered from pond: _____ rai

(3) number of days during dry season water available: _____ days

(4) estimated value: _____ baht per rai per day

f. Rice seedling nurseries

(1) number of families using pond for rice nurseries: _____ families

(2) average size of rice nursery per family: _____ rai

(3) number of days pond water used for rice nurseries: _____ days

(4) estimated value: _____ baht per rai per day.

g. other benefits(uses)

(1) list

(2) estimated values

B. DOF/USAID Management Responsibilities

1. Is Site Team In Place And Functioning:

a. Yes _____; members _____

b. No _____; reasons

2. Has NIFI Prepared Project Manual: Yes _____ No _____

(To cover fisheries policies, all technical matters for pond mgt.)

3. Have Fisheries Stations Provided Seedfish To Pond:

a. Yes _____; No _____

b. number of seedfish supplied: _____ fish(total)

(breakdown by species)

4. Number Of Days Site Team Spent At Pond:

_____ days (Since pond completed on _____ date)

5. Has Site Team Developed A Detailed Operational Plan For Pond:

a. Yes _____

b. No _____; reasons

6. Is DOF Teaching Villagers To Manage Pond:

a, Yes _____; teaching methods used: _____

b. No _____; reasons

7. What Commodities Have Been Provided To Villagers:

a. nets

b. pumps

8. Is Site Team Collecting Pond Performance Data: Yes ___ No ___; reasons:

9. Extension/Training Activities Held
 - a. extension:
 - b. Training:
10. Has Site Team Been Trained At NIFI (or elsewhere)
 - a. Yes _____; where _____ when _____ length _____ attended _____
 - b. No _____; reasons _____
11. Role of Provincial Government In Support Of VFP I
 - a. engineering assistance:
 - b. technical assistance:
 - c. other:
12. Role of Provincial Fisheries Station In Support of VFP I
 - a. seedfish
 - b. site team support
 - c. training
 - d. research
 - e. information
13. Role Of DOF In Support Of VFP I
 - a. funding
 - b. planning
 - c. supervision/monitoring/evaluation/data collection
 - d. training/research
 - e. coordination
 - j. information/extension support

14. Role of AID In Support of VFP I
 - a. funding
 - b. coordination
 - c. advisory assistance
 - d. provision of technical assistance
 - e. monitoring
 - f. evaluation

VILLAGE FISH POND DEVELOPMENT PROJECT
EVALUATION ITINERARY FOR FIELD TRIP

May 25, 1981	Travel Bangkok to Udon Thani by car
May 26, 1981	Visit Sai Ngam Village Fish Pond (#1)* Visit Udon Thani Fisheries Station
May 27, 1981	Visit Yang Song Village Fish Pond (#2)
May 28, 1981	Visit Nong Dern Village Fish Pond (#4) Travel to Sakon Nakhon
May 29, 1981	Visit Sakon Nakhon Fisheries Station Visit Ban Klang Village Fish Pond (#6) Travel to Khon Kaen
May 30, 1981	Visit Tao Hai Village Fish Pond (#5)
May 31, 1981	Visit Khon Kaen Fisheries Station Visit Hin Lat Village Fish Pond (#14)
June 1, 1981	Visit Maha Sarakham Fisheries Station Visit Nong Pluai Village Fish Pond (#13)
June 2, 1981	Visit Nong Fai Mai Village Fish Pond (#7)
June 3, 1981	Visit Nong Pling Village Fish Pond (#12) Travel to Korat
June 4, 1981	Visit Nong Phran Pan Village Fish Pond (#10) Visit Korat Fisheries Station
June 5, 1981	Travel Korat to Bangkok

* Numbers are keyed to those numbers appearing on the map, p. iii.

VILLAGE PONDS

OUTPUTS 1/	VILLAGE PONDS													
	1 Sai Ngam	2 Yang Song	3 Kham Pu Ta	4 Nong Dern	5 Mon Tao Hai	6 Ban Klang	7 Fai Mai	(8) Bua/Phai	(9) Thung Thoeng	10 Phran Pan	(11) Hual Hua Dong	12 Nong Pling	13 Nong Pluai	Hin Lat
VFP Pond Completed	X	X	X	X	X	X	X			X		X	X	X
Nursery Ponds 2/ 3/	X	X			X					X				X
CONSTRUCTION														
Adequate:														
Site Selection	X		X	X	X		X					X		
Design	X			X	X	X	X							
Embankment	X			X	X	X	X					X	X	
Spillway	X			X	X	X	X			X			X	
AQUACULTURE														
Pond Stocked 4/	X	X	X	X	X	X	X			X		X	X	
Fish Harvested 5/		X	X			X						X		
10 kg/person harvested 6/														
Fish Prod.Mgmt. Plan 7/	X													
Fingerlings Produced														
MANAGEMENT														
DOF Site Team Named 8/	X	X	X	X	X	X	X			X		X	X	X
Site Team Trained														
VFP Village Committee Named	X	X	X	X	X	X	X			X		X	X	X
Committee Trained 9/	X													
Pond Mgmt. Self-Reliance														
Adequate Pond Maintenance														
Pond Mgmt Manual														
SOCIAL 10/														
Increased Consumption of Fish														
Uses of Pond for:														
Drinking							X							
Washing					X	X	X					X	X	
Bathing					X	X	X					X	X	
Livestock														
Irrigated Rice Seedbeds				X		X								
Irrigated Orchards														
Irrigated Gardens	X	X		X		X						X	X	
See Pond as Own	X		X	X			X					X	X	
Decreased Underemployment														

- 1/ () indicates ponds not visited by the evaluation team.
- 2/ Ponds #1 and 14 have two nursery ponds but these were in place prior to the construction of the village fish pond. (All nursery ponds were in production.)
- 3/ Ponds #2, 5 and 10 have one nursery pond. (Nursery ponds at 2 and 10 were dry; nursery pond at 5 had been leased to village individual for five years.)
- 4/ Ten of eleven ponds visited had been stocked. According to the level of production being practiced seven of the ten ponds were over-stocked.
- 5/ Four of the fourteen ponds had been harvested. Yields were from three to five times less than predicted at two ponds harvested prior to the evaluation (the other two ponds were harvested during the evaluation and the figures on production were not available).
- 6/ Yields at pond #6 and #12 were 3.5 and 3.7 kgs/capita.
- 7/ Only one village could be described as having received an adequate level of training that could lead to a village pond management plan.
- 8/ A three-person Site Team (as suggested in the PP) was assigned in only one village; the others were two-person teams.
- 9/ Only the committee in Sai Ngam can be considered to have received training.
- 10/ In terms of the project targets which anticipated increased social benefits from a new or improved source of dry-season water, only limited real achievement can be reported.

LITERATURE REVIEWED

1. "Comments on Thailand's Inland Fisheries Program - Prepared to: USAID/Thailand" by Richard Neal, DA/AGR/F, AID/W Oct 19, 1978
2. "USAID Inputs to Aquaculture Development", USAID/Thailand, Oct 18, 1978
3. "A Brief on Inland Fisheries Development in North and Northeast Thailand", The Division of Freshwater Fisheries, Department of Fisheries, Thailand, Feb 28, 1978
4. "Report of the Pre-appraisal/Design Study of Thailand's Village Fishpond Project", by H.R. Schmittou and M. Cremer, Auburn University, Nov 7, 1980
5. Project Implementation Letters Nos. 1 through 8, Aid Project No. 493-0303, Village Fish Pond Development Project, Oct 22, 1979 to June 1981
6. Project Grant Agreement, AID Project No. 493-0303, Sept 26, 1979
7. Project Paper, AID Project No. 493-0303, Village Fish Pond Development Project I, Sept 19, 1979
8. Project Identification Document (PID), Village Fish Pond Development Project I, USAID/Thailand, May 11 1978
9. Project Proposal, "The Development of Multi-Purpose Fish Ponds in North and Northeast Thailand" by Division of Freshwater Fisheries, Ministry of Agriculture and Cooperatives, Thailand, May 1978
10. USAID Field Trip Reports and Office Memos for Village Fish Pond Development Project I
11. "Report on the Preliminary Survey on Social Aspects of Northeastern Villages in Thailand for the Fish Pond Development Project", by Chaleo Roongrujipimon, Prapee Makaranond, Matrini Nathalang, Faculty of Social Sciences, Kasetsart Univ., May 1979
12. "Benefit/Cost Analysis of 110 rai Fish Pond in Amphur Tabo, Changwat Nong Khai", by Rudy Miniutti, Peace Corps Volunteer, Fishery Station, A. Sri Chiang Mai, Changwat Nong Khai, Nov 16, 1978
13. "Aquaculture Planning in Asia", Report of the Regional Workshop, 1-17 October, 1975, UNDP/FAO

14. "Inland Fisheries Progress in Thailand" by H.S. Swingle and E.W. Shell, Auburn University, 1971
15. "Agricultural Statistics of Thailand, Crop Year 1978/79", Ministry of Agriculture and Cooperatives, 1979
16. Project Identification Document (PID), Village Fish Pond Development Project II, USAID/Thailand, September 15, 1979
17. Project Identification Document (PID), Northeast Rainfed Agriculture Development Project, USAID/Thailand, September 15, 1979
18. "An Organizational Analysis of Agricultural Development in Thailand, Thai Government Organizations, UNDP Asia and Pacific Programme for Development Training and Communication Planning," (DRAFT), UNDP/DTCP Thailand, August 1980.
19. "Emerging Communities," (DRAFT), Thailand Institute of Scientific and Technological Research/International Development Research Centre, Canada, December 1980.
20. "A Survey Report on Rainfed Agricultural Projects in Northeast Thailand," Northeast Regional Office of Agriculture, Tha Phra, Khon Kaen, MOAC, April 1980.
21. "Village Socio-Economic Security Development," under the Patronage of H.R.H. the Princess Mother, Northeast Thailand Border Patrol Police Regional Office, Khon Kaen, May 1980 (in Thai).
22. "Structure of Civic Action (Socio-Economic Activities) for Developing Village Security," Northeast Thailand Border Patrol Police, Regional Office, Khon Kaen, 1978 (in Thai).
23. "Methodology Manual for Identifying and Selecting Natural Leaders in Villages for Roles in Socio-Economic Development," Northeast Thailand Border Patrol Police Regional Office, Khon Kaen, 1978 (in Thai).
24. "Village Fishpond Project, Development Plans for Poverty Stricken Rural Areas, 1982-1986," Department of Fisheries, MOAC, 1981 (in Thai and unofficial English translation).

APPENDIX H

SUMMARY COST ESTIMATE AND FINANCIAL PLAN
(US Dollars)

Project Component	AID Grant		RTG ^{1/} (LC)		Total	
	FX	LC	DOF	DTEC ^{2/}	FX	LC
1. Tank Development - Embankment - Spillway - Excavation	-	346,000	-	-	-	346,000
2. Fingerling Production	-	-	50,000	-	-	50,000
3. Commodities (pumps, nets, etc.)	-	-	13,000	30,000	-	43,000
4. Technical Assistance (5 p.m.)	10,000	10,000	-	-	10,000	10,000
5. Training	-	13,000	-	-	-	13,000
6. Operations Research	-	20,000	20,000	-	-	40,000
7. Evaluation (consultant - 1 p.m.)	10,000	3,000	-	10,000	10,000	13,000
8. Recurrent Costs - Salaries - Travel and per diem - Maintenance	-	-	57,000	107,000	-	164,000
Sub-Totals	20,000	392,000	140,000	147,000	20,000	679,000
Contingency & Inflation (7.5%)	-	30,000	-	-	-	30,000
Totals	20,000	422,000	140,000	147,000	20,000	709,000

1/ The RTG contribution does not include valuation of the public land made available for use as fish ponds. This value is estimated to be \$200,000 (325 ha. x \$12,500/ha).

2/ Contribution from the Counterpart Fund of the Department of Technical and Economic Cooperation.

APPENDIX I

SUMMARY USAID GRANT BUDGET-PLANNED AGAINST
REIMBURSED OR ADVANCED TO DATE
 (US Dollars)

PROJECT COMPONENT	PLANNED AID GRANT		REIMBURSED OR ADVANCED TO DOF
	FX	LC	
Pond Development (embankment and spillway)	--	346,000	221,097.94
Technical Assistance	10,000	10,000	--
Training (for local villagers)	--	13,000 ^{2/}	1,838.66 ^{4/}
Operations Research (equipment and materials)	--	20,000 ^{3/}	--
Evaluation	10,000	3,000	--
Sub-Totals	20,000	392,000	222,936.60
Contingency & Inflation (7.5%)	--	30,000	--
Totals	20,000 ^{1/}	422,000	222,936.60

^{1/} There has been no drawdown of these funds. The Auburn Team Study was funded from an AID Centrally Funded Contract and FX funds for the present Evaluation are provided by AID/W.

^{2/} Planned for training of villagers (not yet carried out).

^{3/} For operational research on multiple-purpose pond use at Nong Dern Village Fish Pond (not carried out).

^{4/} Advanced (to be reimbursed to USAID) to DOF for training of Site Teams (not yet carried out).

RECOMMENDATIONS FOR USE OF UNEXPENDED PROJECT FUNDS

Within the remaining six months of the VFP-I, the DOF and USAID should use the unexpended project funds to strengthen project management capabilities. Focus should be on activities that will contribute to achievement of major project targets as well as prepare the way for more effective planning and implementation of the DOF's 5-year fisheries development program and a possible future USAID-assisted follow-on project. Some suggestions are outlined below.

A. Establish Selected Demonstration Sites

The DOF and USAID should concentrate efforts in 4 of the existing VFP-I villages in order to more fully demonstrate the potential for economic and social benefits through a higher level of physical inputs and technical assistance. The 4 villages listed below are considered to be the most capable of significant development because of their levels of local leadership (and villager's participation) as well as the suitability of the existing pond for fish production and other uses. A major purpose of the intensified assistance to these villages should be to use them as sites for practical result demonstrations and training of villages from adjacent areas.

1. Ban Sai Ngam

(a) Present Situation

All ponds are constructed and in production; a separate pond exists for bathing purposes. The main pond is filled to capacity by flooding, but then drains down to the level of the inlet and spillway. The villagers have demonstrated good management and have a high level of interest in the project.

(b) Recommended Construction

- Install concrete tile, sanitary concrete apron/cap and hand pump in two wells for drinking water.

- Install screened gate structures (for water control) on both the inlet and spillway in order to fill the pond to capacity with flood water.

(c) Recommended Production Practices

- Stock at the rate of 20,000 fingerlings/crop (six months)
- Fertilize at the rate of 13.6 kgs of NPK (5-10-5)/rai/month (85 kgs ha/month). (Fertilizer should be placed in a burlap bag and attached to a post so that it is suspended in the water).

- Harvest fish (100 to 150 gms/ea) by seining with 1-3/8" mesh seine every six months and restock after harvesting.

- Encourage villagers to test fish-livestock production methods by constructing poultry and swine pens over pond.

- Encourage villagers to expand gardening activities with fertilizer and irrigation (using small gasoline or diesel powered pumps).

(d) Equipment and Supplies Required

- Concrete well casings and cement for caps (as needed)
- Hand pumps with pipe (two)
- Materials to modify inlet and spillway
- Materials to build livestock pens
- Gasoline or diesel pump, 2" outlet, with intake and discharge hoses (100' for each hose)
- Vegetable seeds and hand tools
- NPK fertilizer (5-10-5) - 5,000 kgs for fish pond, 1,000 kgs for gardening activities. (Fertilizer inputs are for one year).

2. Nong Fai Mai

(a) Present Situation

Only the main pond has been constructed, from which the villagers draw water for drinking and other household purposes.

(b) Recommended Construction

- Construct two nursery ponds (1/4 rai each) below the dam, to be gravity filled from the main pond
- Screen the spillway
- Construct two wells for domestic water

(c) Recommended Production

- Stock at the rate of 8,000 fingerlings/crop (six months)
- Fertilize at the rate of 5.44 kgs/rai/month (34 kgs/ha/month)
- Harvest and restock every six months
- Encourage expanded gardening activities

(d) Equipment and Supplies Required

- Concrete well casings and cement for caps (as needed)
- Hand pumps with pipe (two)
- Materials to screen spillway

- Gasoline or diesel pump with hoses (one)
- Siphon hose, 2", approximately 200' (one)
- Vegetable seeds and hand tools
- NPK fertilizer, 4,000 kgs. for ponds; 500 kgs for gardening

activities.

3. Nong Pling

(a) Present Situation

The village has two ponds; one is used for drinking and the other multipurpose domestic and fish use. While fish production presently is limited, this village has a lot of gardening activities underway.

(b) Recommended Construction

- Construct two wells with casings, caps and pumps
- Redesign inlet (enlarge and relocate) and install gate

mechanisms

- Screen inlet and spillway

ponds to be flood filled--existing drinking pond becomes bathing pond

(c) Recommended Production

- Same plan as Village #1

(d) Equipment and Supplies Required

- Concrete well casings and cement for caps (as needed)
- Hand pumps with pipe (two)
- Materials to modify and/or screen inlet and spillway
- Gasoline or diesel pump with hoses (one)
- Materials to build livestock pens
- Vegetable seeds and hand tools
- NPK fertilizer - 5,000 kgs for ponds, 500 kgs for gardening

activities

4. Nong Pluai

(a) Present Situation

The village has two ponds; a main pond used for bathing, fish production and livestock watering, and an improperly located and dry nursery pond.

(b) Recommended Construction

- Screen spillway
- Construct two nursery ponds below dam of VFP pond (1/4" rai each)

(c) Recommended Production

- Same plan for Village #2

(d) Equipment and Supplies Required

- Materials for spillway screen
- Gasoline or diesel pump with hoses (one)
- Vegetable seeds and hand tools
- NPK fertilizer - 1,000 kgs for ponds, 500 kgs for gardening activities

B. Management Training

To improve the management of the VFP project and to further develop management capability for a DOF/USAID follow-on project or the approved DOF 5 year village fishpond development program, it is recommended that at least three DOF inland fisheries officers be selected for one to three months of in-country project planning and management training and subsequently be assigned full-time to work with the DOF's village fishpond project.

C. Fishpond Construction Training

To develop improved fishpond design and construction capability for the DOF 5 year program or a DOF/USAID follow-on project, it is recommended that a U.S. Pond Construction Specialist be brought in for a period of two months to provide training for selected DOF engineers and fish production staff. The following equipment should be provided for this training:

<u>Quantity</u>	<u>Description</u>
2	Hand level
2	Transit level
2	Tripod
2	Fiberglass leveling rod, 13' (English system)

2	Fiberglass tape, 100'
2	Water cooler, 5 gal.
2	Plastic flagging (ctn of 12)
2	Flagging dispenser
2	Technical pen set
2	Waterproof drawing ink
2	Triangular scale
2	Protractor, 6"
2	Drawing instrument set
2	Drawing board
	Reference books

ANALYSIS OF ECONOMIC MODELS

Benefit - Cost Evaluation Models

Case A (benefit from fish alone - in baht)

Model - 1 (no feed, no nursery pond)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u> ^{1/}	<u>Benefit (70%)</u> ^{2/}
0	859,599	-	-
1	35,998	189,000	132,300
2	27,449	"	"
3	27,449	"	"
4	13,488	"	"
'	"	"	"
'	"	"	"
15	13,488	189,000	132,300

		(100%)	(70%)
Net PV of benefits at 12%	=	294,624	-91,552
IRR	=	19.91%	10.03%
B/C		1.30	0.91

Model - 2 (no feed, with nursery ponds)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u>	<u>Benefit (70%)</u>
0	859,599	-	-
1	35,998	189,000	132,300
2	22,990	"	"
3	22,990	"	"
4	9,020	"	"
'	"	"	"
'	"	"	"
15	9,020	189,000	132,300

Net PV of benefits at 12%	=	321,033	-65,143
IRR	=	18.39%	10.61%
B/C	=	1.33	0.93

- 1/ = 100% of optimum fish yield
 2/ = 70% of optimum fish yield

Model - 3 (with feed, no nursery pond)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u>	<u>Benefit (70%)</u>
0	859,599	-	-
1	84,886	945,000	661,500
2	72,977	"	"
3	72,977	"	"
4	59,016	"	"
'	"	"	"
'	"	"	"
15	59,016	945,000	661,500

Net PV of benefits at 12%	=	5,130,573	3,199,693
IRR	=	100.95%	68.22%
B/C	=	4.93	3.45

Model - 4 (with feed, with nursery ponds)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u>	<u>Benefit (70%)</u>
0	859,599	-	-
1	84,886	945,000	661,500
2	50,682	"	"
3	50,682	"	"
4	36,721	"	"
'	"	"	"
'	"	"	"
15	36,721	945,000	661,500

Net PV of benefits at 12%	=	5,262,515	3,331,635
IRR	=	102.22%	69.73%
B/C	=	5.48	3.84

Case B (with other benefits)

Model - 1 (no feed, no nursery pond)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u>	<u>Benefit (70%)</u>
0	859,599	-	-
1	35,998	276,477	219,777
2	27,449	"	"
3	27,449	"	"
4	13,488	"	"
,	"	"	"
,	"	"	"
15	13,488	276,477	219,777

	(100%)	(70%)
Net P.V. of benefits at 12%	= 890,438	504,262
IRR	= 28.82%	21.86%
B/C	= 1.90	1.51

Model - 2 (no feed, with nursery ponds)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u>	<u>Benefit (70%)</u>
0	859,599	-	-
1	35,998	276,477	219,777
2	22,990	"	"
3	22,990	"	"
4	9,029	"	"
,	"	"	"
,	"	"	"
15	9,029	276,477	219,777

	(100%)	(70%)
Net P.V. of benefit at 12%	= 916,827	530,651
IRR	= 29.24%	22.31%
B/C	= 1.95	1.55

Model - 3 (with feed, no nursery pond)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u>	<u>Benefit (70%)</u>
0	859,599	-	-
1	84,886	1,032,477	748,977
2	72,977	"	"
3	72,977	"	"
4	59,016	"	"
'	"	"	"
'	"	"	"
15	59,016	1,032,477	748,977

Net P.V. of benefits at 12%	=	(100%) 5,726,367	(70%) 3,795,487
IRR	=	111.07%	78.31%
B/C	=	5.39	3.91

Model - 4 (with feed, with nursery ponds)

<u>Years</u>	<u>Cost</u>	<u>Benefit (100%)</u>	<u>Benefit (70%)</u>
0	859,599	-	-
1	84,886	1,032,477	748,977
2	50,682	"	"
3	50,682	"	"
4	36,721	"	"
'	"	"	"
'	"	"	"
15	36,721	1,032,477	748,977

Net P.V. of benefit at 12%	=	(100%) 5,858,309	(70%) 3,927,429
IRR	=	112.28%	79.74%
B/C	=	5.99	4.35

Ban Klang

<u>Years</u>	<u>Cost</u>	<u>Benefits</u>	
		<u>Fish Alone</u>	<u>W/Other Benefits</u>
0	342,050	-	-
1	78,454	72,775	112,775
2	70,745	"	"
3	70,745	"	"
4	35,937	"	"
'	"	"	"
'	"	"	"
15	35,937	72,775	112,775

	<u>Fish Alone</u>	<u>W/Other Benefits</u>
Net P.V. of benefits at 12%	- 181,637	90,797
IRR	2.73%	16.08
B/C	0.73	1.13

Nong Pluai

<u>Years</u>	<u>Cost</u>	<u>Fish Alone</u>	<u>W/Other benefits</u>
0	288,683	-	-
1	62,270	102,450	185,950
2	54,561	"	"
3	54,561	"	"
4	49,092	"	"
'	"	"	"
'	"	"	"
15	49,092	102,450	185,950

Net P.V. of benefits at 12%	= 54,712	632,420
IRR	15.28%	45.13%
B/C	1.09	1.97

On-Going Evaluation/Monitoring of VFP-I

A team of social scientists from the Chulalongkorn University Social Research Institute (CUSRI) has been contracted by USAID to establish a project evaluation and monitoring system and to conduct research related to the VFP during the period June to December, 1981.

Much can be learned about the VFP - how it is functioning and what might be done to improve the project's impact in the villages - by this sort of socioeconomic research. The social analysis included as part of this evaluation is a valuable first step in learning more about how a project like the VFP is perceived at the village level. The work to be done by CUSRI can and should extend the scope and usefulness of information gathered during the evaluation to further assist project management to improve performance not only for the balance of the VFP-I but more particularly for the DOF's 5-year village fishpond development program and any future USAID-assisted project with the DOF.

The following are presented as suggestions to CUSRI, DOF and USAID to increase the usefulness of the CUSRI involvement with the VFP:

(a) In view of the recommendation by the evaluation team that USAID assistance to the VFP-I be ended as scheduled in December, 1981, any work to be done by CUSRI should be predicated on a DOF/USAID agreement regarding some sort of future collaborative effort with a village fishpond program.

(b) In its field research CUSRI should place major emphasis throughout the contract period on gathering and analyzing information about the VFP which is of a practical nature and directly related to project management concerns. General social research on Northeast village life and community organization should not be the objective of this contract.

(c) Because of the rainy-season, which will extend through October, it will be difficult for the CUSRI team to visit and work in many of the project villages. Expectations for the contract team should, therefore, be scaled down to a selected number of high-priority issues related to immediate project management requirements.

(d) The planned baseline surveys of four villages in the vicinity of VFP villages should be completed as soon as possible. However, because this work will have to be done in the rainy-season, and in view of the fact that the achievements of the VFP (in terms of project-related changes in the target villages) has been quite limited anyway, it might be advisable to conduct baseline surveys in only two non-project villages.