PROJECT 0290

CARE INTERNACIONAL EN GUATEMALA

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CARE-GUA # 135-87

Mr. Tom Ivers
Office of Rural Development
USAID
Guatemala City

Dear Tom:

Enclosed for your information is a copy of the evaluation of the Family Fish Pond Extension project carried out by Dr. Phelps and Dr. Hatch.

The evaluation is very well done and provides excellent suggestions and recommendations for improvement.

Sincerely,

Corinne Seltz

Enclosure
CS:rea
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450.5.8

cc: Edward E. Brand, Director - CARE

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EVALUATION OF CARE FAMILY FISH POND EXTENSION PROJECT IN GUATEMALA

by

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EVALUATION OF CARE FAMILY FISH POND EXTENSION PROJECT IN GUATEMALA

Introduction:

The CARE Family Fish Pond Extension Project in Guatemala was established with dietary and income objectives. Low resource farmers in selected communities in eastern and northern Guatemala were the focus of efforts to create new diet sources and income generation. An extension service was established to promote the construction of small fish ponds with the cooperation of the Agency for International Development (AID), Peace Corps and the General Directorate for Animal Husbandry Services (DIGESEPE) of the Government of Guatemala. The project was funded by AID and Peace Corps provided volunteer technicians to train local fish pond promoters employed by DIGESEPE. According to a National Council for Economic Planning study in 1977, the diet of the average rural family in Guatemala was 39% below minimum requirements and the diet of the lower income groups was 49% below acceptable levels of animal and plant protein[1]. These dietary deficiencies are related to the low level of resources available to the rural population. INCAP has estimated that the minimum recommended diet would cost Q.275[2]. Two thirds of the rural population falls below this minimum level and averages about Q85. The CARE Family Fish Pond Extension Project in Guatemala was designed to assist rural low resource farmers by transferring aquacultural production techniques to increase directly the protein in their diets through increased fish consumption and indirectly improve their chances of improved diet through income generation.

DESCRIPTION OF THE PROJECT

Environmental Setting

The project is currently working in 26 communities in the east central and central portion of the country. As of September, 1986 the project included 565 ponds being managed by 1059 families. During the evaluation, ponds were visited in the areas of San Juan Chamelco in the Department of Alta Verapaz and Quetzaltepeque, El Rodeo and Olopa in the Department of Chiquimula.

San Juan Chamelco is at an altitude of approximately 1500 m in a zone that could be considered cloud forest. Overcast skies are common with an annual rainfall of 2124 mm distributed over 10 months of a year. Mean air temperature is 17.9° C. The land is steep with few sites for ponds greater than 200 m^2. Water was generally available from small streams. Land holdings were small and being managed for traditional crops i.e. corn and beans. Few to no

livestock were observed on small farms. Most small farmers of the region would be considered to be of Indian ancestry.

The Quezaltepeque area is an area with a distinct dry season from November to May. Annual rainfall is approximately 1652 mm. The climate is warm with a mean air temperature of 21.6 C with elevations of 800 to 900 m. One area visited with 5 ponds was a 40 minute walk from the road in a small valley. It was an area of steep slopes and no permanent streams. Seep springs were being captured using catchment boxes to supply each individual site. Pond sites were limited due to water availability and the slope of the land. Other sites were more accessible but had similar water sources and land characteristics. A lack of rainfall in the region resulted in a number of ponds in the project drying out for several months during the dry season.

The farms visited were generally subsistence level producing traditional crops but often having some type of livestock either chickens, a pig or cow. The farmers would be considered to be of mixed ethnic background or ladino.

The El Rodeo community was located at an elevation of approximately 900 m at the upper end of a large valley. The dry season for the area was said to be 4 to 5 months. The ponds visited were small (100-200 m^2) on gently sloping land that would have permitted the construction of larger ponds. The pond water supply was a small irrigation canal that had been hand dug, diverting water from a stream. The main valley was principally pasture with some rice production. The farm visited had corn, sugar cane, rice and a hog. Road access was adequate to Esquipulas and would permit the use of heavy equipment for pond construction.

The Olopa area is an isolated area with an elevation of 1100-1200 m but accessible by road. It is an area of steep slopes but with valley floors of less slope suitable for pond construction. The water supplies for the ponds were water diverted from small streams. The dry season is distinct and resulted in some ponds in the area drying out. Crops in the area included corn, beans and coffee. There was little livestock in the area except for a few teams of oxen for plowing.

The program in this area was the most developed of any of the communities visited. There was approximately 2000 m^2 in ponds for a community of 500. Several individuals had more than one pond.

Production System

A generalized fish production system would be described as follows. The pond sizes were typically 100-200 m^2 with the mean of the 565 ponds in the project being 201 m^2. The ponds are stocked either with tilapia or a combination of tilapia, common carp or snails. The fingerlings initially were provided by the

government at no cost but currently they are being sold at Q0.03/tilapia and Q0.10/carp. In addition the farmers themselves are producing more of their own fingerlings. In 1986 the farmers produced 34.5% of the fingerlings used.

The management practices varied with the resources and interest of the farmers. The ponds were fertilized with either compost, manures or inorganic fertilizer. The fish were often fed either corn, a chicken feed, table scraps or spoiled fruit. There were no records of the amount of fertilizer or feed being added per pond. The ponds were sampled approximately monthly for growth and the feeding rates often adjusted. It was recommended by the promoters that the ponds be drained every six months. Records for 1986 showed that ponds were drained after 4 to 14 months with a mean of 6.9 months. Harvest are made during the culture period with hook and line, cast nets or seines. Fish were often removed during the monthly sampling for home consumption. The cast nets were locally made but not available in every community. The seines are controlled by the promoter and are used with the assistance of the promoter or are loaned to farmers for both partial and complete harvests.

Initial construction of pond and animal enclosures was done by adult males. Many of the daily labor activities (feeding and fertilizing) were done by women. Final harvest and repair of pond or structures was done by adult males. Often the labor activities of the adult males were achieved on a cooperative basis with extended family members or other adult males in the community. The daily pond activities did not tend to require additional non-family labor.

In the first nine months of 1986 a total of 186 ponds were completely harvested. The yields from a sample of 75 ranged from 84 to 3204 kg/ha with a mean of 1171.8 kg/ha. In addition to the yields at harvest, an additional not quantified amount of fish were removed through partial harvest. The mean yield for complete harvest of 1171.8 kg/ha/crop is similar to the goal of the project 1,362 kg/ha/crop (i.e. 0.6 lb/m^2/yr).

A variety of sizes of fish were harvested with all sizes being accepted as food. The price per pound varied from community to community between Q1.25 and Q2.00/lb live weight. In some communities small fish were sold at Q1.25 and larger fish at Q1.50/lb. The percent of the harvest sold varied from 0 to 100%. In 1986, 84 ponds of 184 harvested reported selling a portion of the harvest. The mean percentage sold was 47% for those selling fish.

The ponds being used were an average area of 201 m^2. Each site generally had one pond but in areas where the program was older it as common for more farmers to have more than one production pond. Farmers were also encouraged to construct fingerling storage ponds. These were 10-50 m^2.

The ponds were hand dug by the farmer with often help from friends. Construction tools were made available by the promoter. CARE would give the farmers the materials such as PCV pipe for drains, polyvinyl pipe for water supplies, and concrete.

Only in El Rodeo were the sites accessible enough and the slopes sufficiently gentle to consider the use of heavy equipment for construction. The majority of the sites visited were restricted in the number and size of ponds that could be constructed by the amount of land available and its slope. Some were located in wet poorly drained areas of little agricultural value, others were on better drained slopes that could be in crop production.

The water supplies for the ponds were by gravity from either a diverted stream or springs. Often the water source originated 1/2 to 1 km from the site and water transported via canal or pipe.

Generally, the water supplies were designed only to provide water for the ponds. In Quezaltepeque the water was also being used for domestic purposes. In El Rodeo the water supply canal was part of a small irrigation system.

Integrated projects have begun at all sites visited except El Rodeo using either broiler or layer chickens or pigs. The project in total has 23 pond sites that are integrated, seven are layers, thirteen are broilers, and three are with rabbits. The densities per surface area of pond were: layers 1/4.5 m^2; broiler 1/3.73m^2; and rabbits 1/10.5 m^2. Plans are to also include ducks and goats as part of the integrated systems.

DIGESEPE is producing layers, pigs, goats, ducks and rabbits for distribution to the project. Currently layers are available at Q2/bird. Broilers are generally purchased in the region at Q0.70/ bird.

Chickens were being fed a commercial chicken feed costing Q0.33/lb and supplemented with corn produced on the farm. One site with layer chickens would allow the birds to forage during the day and return to the coop at night. The coops seen were made by the farmer with locally available material with some items such as nails and were being purchased. The coops were located over the pond.

The success of the broiler operations varied on the first crops but generally by the second crop they were profitable enough to have a positive net return relative to the variable costs. Feed conversions ranged from 1.91:1 to 4:1. Broilers were sold at prices that were approximately Q1.25/lb live weight.

All layer operations visited were just underway with none having egg production at the moment. Data was available for one layer operation where it was estimated that returns over feed costs were $1.23/day. No details were available for the other animal production systems.

Subsidy and Credit

The construction of ponds and animal enclosures have been subsidized to the extent that local material cannot be used and subsidies for production costs have been developed where they represent significant cash needs. Subsides and credit arrangements have largely resulted form PCV's judgment on the participants' ability to pay and have been based on the principle of ensuring that participants make a substantial commitment of their own resources.

All purchased materials for pond construction are provided by the project at no cost to the participant. The latter is responsible for obtaining all local materials and providing labor. Construction equipment is borrowed from PCV's. Initially, fingerlings were free but, more recently, they have been sold at Q0.03 for tilapia and Q0.10 for carp.

Construction of chicken coops has been generally achieved with local materials available to the farmer and his own equipment and labor. The only chicken coop construction subsidy has been free chicken wire.

For broilers, commercial feed, vaccines and one-day old chicks are free for the first cycle (two months). For layers, commercial feeds were free until egg production starts (4 months), vaccines are donated by DIGESEPE for the first 6 months, and six-week old chicks are sold at at cost.

Pig sties are generally constructed form local materials supplied by farmers except for cement for flooring provided by CARE. Piglets are supplied using the Heifer Foundation principle of payment in kind with an offspring from the original animal. Vaccines are purchased by farmers and commercial feed is free for the first six months.

Support Structure

The program is being conducted by three principals entities: CARE, Peace Corps and DIGESEPE. CARE's role is principally administrative, monitoring the project's progress, providing materials for the field program and coordinating activities among the agencies involved. Peace Corps has provided volunteers that are taking the lead in the extension program. The program began with 7 volunteers in 1983 and has grown to 23 in 1986. DIGESEPE has provided both technical and logistical support to the project. Two stations are currently managed by DIGESEPE to provide fingerlings and are now also preparing to provide the livestock for the integrated activities. A third station is scheduled for renovation this year and will be incorporated into the project. A total of 25 promoters have been hired by DIGESEPE to help conduct the extension program.

The extension program is centered around the Peace Corps Volunteer. The volunteer upon arrival at his site begins to get to know the region, its people and resources. Once familiar with the possibilities for aquaculture in the area the volunteer would meet with individuals and groups in the area to promote aquaculture. A general goal for a volunteer has been to build 10 ponds the first year and 15 the second year of his tour.

In addition to promoting aquaculture the volunteer is responsible for selecting and training a local farmer to be a promoter. The goal is that these promoters, hired by DIGESEPE, will be able to continue the extension program once Peace Corps has phased out of that location. The promoters are generally successful fish farmers that the volunteer has been working with. Currently, 25 promoters have been hired. It is anticipated that in the Olopa area this year that the promoters will assume full responsibility for the field program.

The area of coverage for the promoter/volunteer varies with some promoters being responsible for up to 24 ponds. Biweekly to monthly visits are made to the pond site discussing management practices with the farmer and often sampling the fish. The volunteer is provided by CARE with a motorcycle whose operating costs are provided by DIGESEPE. The locally hired promoters have no transportation specifically provided.

PROGRESS TOWARD PROJECT GOALS

The project has both final and intermediate goals and target indicators to monitor progress toward project goals for the period 1983 to 1986. Final goals were:

1. Improvement in the rural family diet of 1,500 low-income families in 20 communities in the departments of Zacapa, Chiquimula, Baja Verapaz and Alta Verapaz by an increase in the consumption of fish from 1.1 lbs. (0.50 kg.)/person/yr to 4.2 lbs. (1.41 kg)/person/yr by 1986 through fish produced in family or community managed fish ponds.

2. Creation of a reliable new source of small scale income generation for those project beneficiaries who construct ponds with a total surface area in excess of 200 square meters.

Intermediate goals were:

1. Effective training of fish pond promoters.

2. Establishment of a functional fish pond extension service.

3. Effective technical management of central fish station(s) for the provision of fingerlings for pond-stocking.

4. Effective pond management.

The number of families participating in the project was 1059 and the number of communities was 26. Per capita fish consumption has been increased by 1.09 kg (goal 1.4 kg) for participating families. This consumption increase is based on information from complete harvests only and could thus underestimate the increase in fish consumption by the amount of partial harvests and unregistered harvests either by participants or non-participants. Of 184 records of complete harvest in 1986, 84 sold approximately 47% of their fish.

Annual comparisons of planned and actual data on target indicators are presented in Table 1. The number of ponds constructed and rehabilitated has not reached its target; however, pond area has exceeded expectations. The number planned was particularly optimistic and the training of PCV's and promoters did not proceed as rapidly as planned. Also, in 1985, development strategy was altered to put more emphasis on quality of ponds and their management as opposed to simply the number of ponds. This change in strategy was appropriate and should be continued. Technical seminars have not been as frequent as planned; however, demonstrations have actually surpassed expectations. With the move toward emphasis on quality over quantity, technical seminars and demonstrations will be increasingly important and should be expanded.

The stations have been very effective in producing fingerlings. In 1985 production was double the planned level, reflecting both more area in ponds and higher stocking rate. Also, it was estimated by a survey of PCV°s that approximately one third of fingerling requirements are satisfied through on farm sources. As producers become increasingly self sufficient in fingerling production, plans for fingerling production at the stations should decrease; thereby releasing some ponds for demonstrations and research.

Of 565 ponds that have been constructed, 94 or 17% have been abandoned. Reasons for abandonment as reported in a recent survey conducted by CARE are:

1.	Lack of interest	33%
2.	Too large	12%
3.	Lack of assistance	12%
4.	Adverse climate	9%
5.	Poor site	9%
6.	Lack of money	4%
7.	Thievery	4%
8.	Fumigation	2%
9.	Communal management	1%

Table 1. Planned and Actual Data for Selected Target Indicators for Evaluation of CARE Family Fish Pond Extension Project in Guatemala, 1986.

Target Indicators	Years							
	1984		1985		1986[2]		Total	
	Plan	Actual	Plan[1]	Actual	Plan	Actual	Plan	Actual
Pond Construction & Rehabilitation (number)	225	157	300 (226)	169	450 (227)	109	975	435
Pond area (000's m^2)	22.5	30.5	30.0 (40)	37.9	45.0 (47.1)	15.1	97.5 (109.6)	83.5
Technical seminars (number)	3	2	3	1	3	1	9	4
Fish culture demonstrations (number)	120	165	120 (270)	118	120	n.a.	360 (510)	283
Technical field coordinator (training man/days)	30	0	60	600	60	n.a.	150	600
Promoters trained (number)	15	14	2	0	18	19	35	33
Pond construction goal per promoter[3] (number)	15	4	16	0	30	n.a.	61	4
(area)	15	8	16	1	30	n.a.	61	9
Pond production rate goal[4]	7	4	100	57	100	n.a.	--	--
Total annual prod. (000 lbs.)	13.5	4.1	18.0	12.9	42.0	n.a.	73.5	17
Fingerling production (000)	56	52	40	83	42	n.a.	138	135
PCV (person months)	96	84	104	114	120	147	320	345

1. Numbers in parenthesis under plan are adjusted plans.
2. Data for 1986 includes only the first eight months.
3. Annual pond construction goal per promoter was 15 ponds per year and annual pond construction rate goal was 1500 m^2 per promoter.
4. Annual pond production rate goal was 0.6 lbs./m^2. In 1984 it is presented in numbers and in 1985 and 1986 in percent. Because of unit change, no data is presented in total column.

As an indication of participants' acceptance of project, 191 or 34% expressed interest in constructing an additional pond. Reasons for low production as judged by PCV's were similar to reasons for abandonment:

1.	Poor management	33%
2.	Climate	26%
3.	Negligence	16%
4.	Lack of money	10%
5.	Low quality fingerlings	8%
6.	Thievery	5%
7.	Pond size	3%

Also, production was probably much better than harvest records indicate as 67% of PCV's believe farmers are not reporting much of their home consumption.

PCV's appear generally satisfied with their promoters with 82% reporting adequate support from promoters. However, support from DIGESEPE received mixed results:

1.	Adequate support	33%
2.	Inadequate support	27%
3.	No opinion	40%

Several marketing issues were addressed by a survey of PCV's. Only 31% reported a difference in price of fish based on size. Marine or lake fish were commonly sold in 83% of the locations, but only 11% of PCV's felt that the alternative source of fish would compete with sales of pond-raised fish. Seventy-nine percent believe there will be no problem selling fish. Areas that anticipated problems included: Jalapa, Quezaltepeque, Olopa and Mariscos.

GENERAL OBSERVATIONS AND GENERAL RECOMMENDATIONS

Environment

The areas of Quezaltepeque and Olopa had the most favorable areas for fish culture due to a more favorable climate and a greater possibility for suitable construction sites. Temperatures in the Chamelco area were minimum for tilapia culture but no observation as to the effect of temperature could be made, as the ponds seen were also infertile. Considerations should be given to limit the fish culture project to areas of 1,500 m^2 or less with mean air temperatures above 20° C.

Water availability is an issue in some areas as it was mentioned that during the past year which was unusually dry, several ponds dried up and farmers were limited as when they could drain and fill their ponds.

The economic and social setting varied considerably from site to site and appeared influence the success of the project.

At El Rodeo the ponds were not being managed well which may have been due to the other economic opportunities to farmers in the area were more attractive and they did not depend upon their pond as much for food or income.

In the area of Quezaltepeque and Olopa the farmers were better pond managers and it appeared that the pond was a more significant part of the farm resources.

Fish Culture System

A common problem in fish culture programs oriented to the small farmer is the lack of nutrients available for use in the pond. This problem does occur in the CARE project as well. In a sample of 75 ponds, 18 had yields of less than 500 kg/ha. That level of yields could result from natural water and soil fertility with no nutrient input on the farmers part. The majority of ponds visited during the evaluation, that did not have associated livestock, appeared infertile.

Increasing fertility without livestock by the pond would be difficult for most farms visited. It is often difficult to convince new fish farmers as to the importance of maintaining good plankton blooms and more so when he does not have a fertilizer source readily available. The new phase of the project which will emphasize integration of animals is an essential step to making the ponds more productive.

Consideration should be given to changing stocks of fish being used, particularly the "red" tilapia. This variety, a hybrid of T. mossambica with other species, is not as fast growing, will reproduce at an early age and is more sensitive to low temperatures and handlings. It is better to use a pure line of T. nilotica. Similarly the Koi strain of common carp being used is not one selected for growth but ornamental purposes. A mirror carp line of common carp might be more appropriate.

The basis and objectives of the current management practices should be reviewed. It appeared that there was no technical base from which the extension recommendations are being made. Current stocking rates are producing acceptable results but could be refined taking into consideration the nutrients available to a farmer and the use of fish when produced.

In particular, stocking densities of carp should be reduced. Carp have a habit of muddying the water of a pond when the biomass reaches 700 to 900 kg/ha. This more turbid water results in a less productive pond thus limiting the biomass to a level less that which could be supported before the pond becomes excessively turbid. An appropriate density of common carp would be 1/10-20m^2. This will result in a larger animal after 6 months and will not produce excessive turbidity.

The fact that any size fish will be consumed with basically the same acceptance is an important fact. It is much easier to produce a mixed sex culture of tilapia without having to control reproduction. It will also produce the greatest biomass of fish considering the nutrients available. Some interest was expressed in having monosex cultures of tilapia. This should be reviewed carefully before being encouraged. Criteria should be that: small fish are no longer acceptable in the community; the price difference between small and large fish should be large enough to compensate for the effort of producing larger monosex fish; and that, those which go into monosex production do so for strictly commercial objectives.

When mixed sex culture of tilapia is being practiced it is essential that the ponds be harvested before carrying capacity is reached. This would generally be within 2 to 3 months after the first reproduction of tilapia in the pond is observed. Additional months of culture will not result in significant fish production but only adds to the production costs.

Another aspect to the importance of harvesting at the appropriate time is related to the trend of the farmer producing more and more of his own seed. Excessively long culture periods for the production pond will result in stunted fish. If small stunted fish were removed at harvest for restocking, it may result in tilapia spawning within one to two months into the new production cycle. This in turn will result in the initial stock not increasing greatly in size and a large weight of small fish.

Where fingerling ponds have been built efforts should be made to maintain them in production either for food fish or temporary storage of fingerlings for the next production cycle. For the future of the project it will be essential that the farmers are capable of producing and distributing fingerlings among themselves. The isolation of many of the communities make it difficult for fingerlings to be transported in from the government stations. Also any budget reductions in the government program will make fingerling distribution to isolated sites difficult. The sale of fingerlings among farmers should be encouraged at the same time gradually increasing the price of fingerlings produced at the government station.

The production of silver and grass carp fingerlings by the government stations should take into consideration the difficulty of their distribution to all of the project sites. The need to artificially induce spawning of these two fishes will generally not allow a farmer to produce his own fingerlings. Consideration should be given to limiting the use of these species to areas with easy access to the stations or to areas with the potential for large scale commercial aquaculture.

The use of concentrated feeds should be examined in detail. The small scale nature of most ponds in the project does not merit the need for buying commercial feeds and transporting it to the site. Several alternatives exist. It is feasible for ponds of

100-200 m^2 to receive feeds produced on the farm. This can include the production of green leaf material such as Colacassia on the damp soils near the pond.

The best alternative for increasing fish production and reducing the need to purchase food for fish is the integration of livestock into the project. At most every site visited where chickens where held in coops over the pond resulted in improved fish production. Particular attention should be given to the use of laying hens as the principle animal to be used at most pond sites. Layers appear to have several advantages in that once in production they will give a daily supply of eggs for sale and home consumption. It is feasible to allow layers to forage during the day around the pond and return to the coop at night. This will reduce the feed costs associated with their production. A cycle of layer hens said to be one year will result in a more constant supply of manure entering the fish pond and in turn improved fish production. Broilers may be appropriate for more cash oriented farmers able to manage money. The shorter production cycle, the need to buy chicks and feed, and sell all the production at once, requires better management.

Swine may be appropriate in areas where farmers already raise pigs. However, when pigs are confined and managed more intensively the need for supplimental feeding is great. It was estimated that approximately Q800 in commercial feed is needed for rearing a hog to market size. Such a cash commitment would not be possible for most farmers of the project.

Other animal such as rabbits, ducks, goats, dairy cattle etc., are worth considering for incorporation into the project. Additional details are given in the specific recommendations section for developing technical packages for these animals.

Several aspects related to pond construction were observed. One is in regard to access to the sites and the need to cluster activities. Several sites visited were rather isolated making it difficult to have ready access to technical assistance, commercial feeds, new livestock, and markets for the products produced. As each new site is selected it should not only be viewed as to the suitability of the soil for pond construction or the availability of water for one pond. It should also be viewed with the idea of what technical production package would be appropriate and that the necessary inputs could be provided and markets exist for the products.

The community as a whole should be viewed as to what development possibilities exist for the water and land resources available. In several areas the need for water was just as critical as the need for fish production. It appeared several times that multiple uses of a water source could be obtained where it was developed just for the fish pond. For each new site consideration should be given to whether one common water source could be developed for the present site and any future sites that might be developed in the community. The possibility of water

storage in reservoirs and microirrigation from that water source should also be considered. Particular consideration should be given to obtaining the maximum use of the water once it arrives at the farm. This would include domestic use, irrigation of gardens and watering livestock. Ideally the site chosen for the pond would favor as many of these activities as possible.

The development of more than one farm in a community and more than one pond per farm should be encouraged. Aquaculture is a very new activity for the small scale farmer in Guatemala and a great deal of benefit can be obtained by having several fish farmers in a community. It improves the efficiency of the extension program, allowing the promoter to reach more farmers in less time. It allows farmers to share ideas regarding common problems and through peer pressure improve production. It will also improve market demand for fish in the area as more become available and people become accustomed to having it available.

Each farmer should have more than one pond. This will allow him to produce his own fingerlings and always have one pond in production. By always having one pond in production it can help insure a more steady supply of fish for home consumption and the sale of small quantities. It appears that aquaculture is a profitable agricultural activity and having more than one pond would facilitate the farmer devoting more time to his ponds and improving production.

Most every pond visited had considerable seepage and had a continuous flow of water entering the pond. This is utilizing water that could be put to other uses if the ponds were better sealed. This seepage was making land just below the pond excessively humid and not suitable for agriculture. Efforts should be made to drain this land and develop it into family gardens. The seepage can be reduced by building a clay core in the center of the dam and extending it a minimum of 30 cm into the subsoil.

The average size pond of 201m^2 is often a reflection of the constraints of the lack of sites for much larger ponds and amount of labor needed to construct larger ponds. Farmers should be encouraged to build larger ponds when at all possible as well as building more than one pond. But it also must be kept in mind that yields per unit area may decrease as pond size increases. Production records from the project support this with ponds of 200m^2 being more productive per unit area than larger ponds. This is perhaps a reflection of the amount of nutrients available per farm for use in whatever size pond. This availability of nutrients per farm should be taken in consideration as production goals are set. This limited amount of nutrients per farm is another reason to encourage the development of integrated systems. When a pond is integrated with livestock it will be possible to construct larger ponds and maintain a high productivity per unit area.

A 4 inch diameter drain pipe of PVC was the standard for all ponds regardless of their size. In all cases seen a 3 inch pipe would be adequate and in most cases a 2 inch diameter PVC pipe would be suitable. The use of smaller diameter pipe would facilitate future farmers to be able to buy their own material.

Support Structure

The current success of the project is due in large part to the dedication of the Peace Corps volunteers. Their energy and drive has started projects in parts of the country that would not otherwise been reached. The objective of each volunteer training a promoter to expand and continue the program is an essential element. History in Guatemala has shown that where an extension program was not active in a community for at least a number of years aquaculture rarely became established. Peace Corps working with the Penny Foundation had earlier conducted an aquaculture extension program but this program lasted only for a few years and

The promoters are the insurance that the program will continue once CARE and Peace Corps reduce their participation. Their selection should be done with care and only after the volunteer has been in a community a year. Criteria for selecting a promoter should include that the individual is an active successful farmer of the area who has produced several crops of fish himself. He should be of similar economic and social class of the farmers with which he would be working. He should be able to read and write and have basic math skills. He must be respected within the communities and show leadership skills.

Once identified the promoter should work in close contact with the volunteer assisting in all the extension activities and receive specialized training for certain skills. In several areas the promoters where considered by the volunteer to be adequately trained for the promoter to operate without direct supervision. This is an important step but should be gradual to insure the quality of the program.

Although the promoters were considered to be adequately trained to act independently they generally did not have adequate logistical support to do so, particularly transportation. The distance between communities makes it difficult for promoter to reach each community frequently enough to be effective. Some provision must be made to provide the promoters a motorcycle or horse. An area of concern is whether the promoters will continue their aquaculture extension activities once the project ends. They are currently being paid by DIGESEPE but questions have been raised as to whether this would continue once the project ends. One speculation was that the need for the promoter would be so strongly felt by the communities that they would pay the promoter for his assistance.

This is not a realistic expectation. The communities do not have a strong enough economic base to support a promoter. Provisions must be made for DIGESEPE to continue to pay the promoters. Another problem that should be anticipated is how to maintain motivated promoters. Currently part of the promoters motivations come from being able to work with the volunteer and learn new skills. The success of the integrated project after the volunteer leaves will depend a great part on how motivated the promoter remains. Plans should be made to evaluate the success of the promoters in the Olopa area one year after Peace Corps has transferred their effort.

The extension program has resulted in a large number of ponds being built throughout many isolated area of the country. This in some cases produced difficulties in being able to provide services needed to each site. As mentioned earlier future efforts should concentrate on selecting communities which several farmers are interested in participating and each farmer has the possibility of several ponds. Continued emphasis should be given to improving the quality of the ponds in operation rather than building new ponds in new areas.

The best way to insure continued success of the integrated approach after the CARE program ends is to have farmers believe in it as a way to sustain their households and generate income. The technical package proposed for use should be based on inputs readily available to the farmer without any outside assistance. Emphasis in the extension program should be to make each farmer a successful independent operator who looks to his peers to solve common problems and is not dependent on government support.

CARE should be prepared for the strong possibility that the promoters will not be active after the project ends and no logistical support to the farmer will be available. Emphasis should be given to trying to make the farmer as self supporting as possible. This would include extending technical packages that are economically and socially sound. The data collection activity and the study of the production systems will be the mechanisms for insuring that the extension packages are valid. The acceptance of this information by the farmer and its incorporation into his farming practices will depend also on the effectiveness of the promoter and training provided the farmer.

As the project moves into the new phase of integration emphasis should not only be given to integrating livestock with pond production, but integrating aquaculture into the overall farm activities. The volunteer or promoter should be very familiar with the agricultural activities of the area. He should assist the farmer to improve his farm by utilizing the water supply made available by the fish pond. In particular considerations should be giving to incorporating vegetable gardens as part of the integrated package.

How fast a farmer becomes confident in his production skills and needs little to no assistance from the extension program is a question. An integration of activities requires that a number of new

skills may be needed to be introduced. Hopefully that after three to four crops of fish a farmer will feel confident in his fish culture skills and will be convinced of the value of the activity. How many cycles of the other production activities will be necessary, is hard to speculate at this time. Many farmers are accustomed to producing livestock but not as intensively as being promoted in the integrated program. Few farm visited had a tradition for household gardens to produce vegetables. This aspect may require a longer period to be accepted. It should be anticipated that a period of up to 6 years of frequent extension support might be required for a farmer to accept and successfully manage a complete integrated system.

The role of the government stations should be reviewed. Hopefully there would be no need for tilapia and common carp fingerlings to be provided by the stations in areas where the project is established. The stations should only provide fingerlings for the new areas. Where there has developed a dependency on fingerlings from the station, the stations should increase the price of the fingerlings to stimulate the production and sale of fingerlings by the farmer.

During the visit it was difficult to adequately establish the need for the stations to provide livestock for the integrated projects. Broilers appeared to be accessible for most farmers from private sources. Consideration should be given to emphasizing the approach used by the Heifer Foundation for certain livestock. The stations could provide an animal to the farmer free but with the understanding that he return an offspring to the extension program.

One essential role for the stations is to serve as demonstration and training centers. The concept of an integrated system may be difficult for some farmers to visualize. The mini-stations in particular would be good sites for demonstrations of the integrated approach. Such demonstrations will also be suitable for the collection of production data that is needed to support the extension program.

An effort should be made to utilize the stations to develop technical packages for the extension program. Currently the base for extension recommendations is weak and little information is available as to what combination of fish and livestock will give what yield. The stations could be used to develop this information. Detailed suggestions are given in the specific recommendations.

SPECIFIC OBSERVATIONS AND RECOMMENDATIONS

Information Gathering

Several information gathering activities are recommended to provide a better base upon which to develop recommendations to

farmers and for project implementation. Information gathering activities should include:

1. description of local environment,
2. detailed production records,
3. general pond records,
4. financial accounting, and
5. success/failure profile.

Each PCV should compile a description of the local environment including physical, social, political and economic factors. Emphasis should be placed on how project activities fit into existing environment. Can these activities compete in the local economy and will activities persist after project termination. PCV°s should be given ample latitude in how they address this issue; however several factors that should be essential include:

1. land and water resources
2. seasonability of
   a) employment opportunities
   b) production activities
   c) prices
   d) water availability
   e) consumption pattern

The PCV should determine which participants, maybe five per PCV, are capable of keeping good detailed production records. Details of a suggested data base are presented in Appendix A. This information is essential in providing recommendations to farmers, particularly on appropriate input use. The farmer would keep records on a daily basis and the PCV should visit him regularly (probably twice a month) to be sure records are being kept properly. The PCV would report the farm records to CARE coordinators on a monthly basis. The data base structure (Appendix A) should be revised based on preliminary testing of the data collection procedures.

General pond records would be kept where detailed records are not appropriate. The general pond database is divided into a monthly file and a permanent file. The latter would contain information that will not change on a monthly basis. Also improved financial accounting records to assist CARE administration would aid project efficiency.

A success/failure profile should be developed on characteristics of farmers, site, PCV, promoter, production association and local economy. What characteristics would help identify where to build ponds? What activities of PCV, promoters and production associations are most appropriate? What is the effect of the local economy on success/failure. Why are ponds abandoned?

Production/Marketing Strategies

There is a need to develop several strategies (technical packages) based on production and marketing circumstances. Strategies should be based on such factors as:

1. animal combinations used in integrated site,
2. home consumption/cash objectives,
3. farmers' resources:
   a) manure source
   b) water source/pond quality
   c) nursery pond
   d) multiple grow-out ponds
   e) availability of inputs
   f) financial

4. market:
   a) demand for project outputs
   b) transport
   c) market requirements (consistent quality, quantity and timing)

5. physical factors:
   a) climate
   b) elevation
   c) dry season
   d) soil/water fertility

When these strategies have been developed, recommendations can be made for appropriate management practices under differing circumstances. Identification of appropriate strategies will assist in focusing research at stations on critical issues for farmers.

Development of Technical Package

One of the points that was apparent in the first phase of the CARE program was that the production recommendations were not based on specific research information but more on impressions and accumulated experiences. A much sounder set of technical recommendations need to be developed for the fish production activities especially as the project moves to incorporate new animals as part of the integrated approach. Current practices regarding stocking density of fish and number of animals varied considerably. This makes it difficult to give recommendations as to what yields would be expected. Economical management practices need to be developed for each animal giving the details of inputs required and costs. Such packages should include the animal yield and anticipated mortalities and disease problems, as well as how the animal can be marketed and the price that should be anticipated.

Both the three DIGESEPE stations of San Geronomo, La Fragua and Pinula as well as the five mini stations can be used to develop

more complete technical packages. The DIGESEPE stations should be used for studying both livestock production systems and various integrated packages. The mini stations can be used to field test various packages and determine their economic feasibility for that particular region.

Model production packages should be proposed then analyzed as to what aspects of the package has the greatest weakness in regard to the basis for the recommendation. These weaknesses then should receive priority in any investigation.

The following basic production system is recommended for consideration for use in the extension program and for refinement through a series of field trials at the stations.

Fish
tilapia $3/m^2$
common carp $1/10\ m^2$
snails $1/m^2$

Livestock
layer chickens at 12 caged birds per 100 m^2 of pond

The culture period for fish would be 6 months with partial harvests at months 4 and 5 removing 25% of the initial stock each time. The fish would be sampled monthly for growth. The layers would begin egg production at approximately month 4 and continue to be in production 8 more months.

Tne layers would be held in cages and fed a commercial ration. The tilapia would not be fed separately nor the pond fertilized additionally. The sole nutrient source would be waste chicken feed and manure. Detailed records would be collected on the inputs and outputs for both the fish and chickens.

This production system would be the basis for production trials to be conducted at the stations. It is proposed that 4 ponds at each of the three stations be made available. In the first series of trials, it is suggested that the effect of density of fish be studied. At La Fragua and San Geronimo the densities of 1 and 3 tilapia/m^2 could be studied in the first production cycle. At Pinula the density of carp 1/3 and 1/10 m^2 could be studied. These cycles would be repeated one or more times until the results appeared predicable. At that point another factor could be varied and the process repeated.

The mini-stations could be used to demonstrate various livestock combinations. The density of fish would be held the same in all ponds but the type and density of livestock would after several cycles be varied. Detailed records on all production aspects would be kept for each cycle of fish or livestock.

The main government stations could also be used to do production trials for the various animals being considered for

integration into the package. Specifically the issue of appropriate diets could be addressed. One of the major limitations to an integrated system is having to confine the animals at the pond and provide them an adequate diet. Commercial feeds are often not readily available and if so may be at a cost such that their use makes the animal production unprofitable. The alternative of using feedstuffs that are more readily available and economical to the farmer could be investigated at the stations. Such trials would include proposing diets made of locally available material that would meet the nutrient requirements of the animal. These diets would then be evaluated economically to determine if the ingredients and the preparation of the diet would result in a product having a cost advantage over the commercial ration. If these diets appeared to have a cost advantage then they would be fed to the appropriate animal and its performance and profitability would be compared to the commercial ration.

Computer software is available to compose less-cost diets based on price and nutrient composition of feedstuffs and nutritional requirements of the animal. Copies of this software will be made available through the Water Harvesting Project in a format compatible with CARE microcomputers.

Training and Technical Assistance

The integrated approach of the new phase will require a careful coordination of the types of technical assistance available to the farmer. It will require a cross-training of both the volunteers and promoters in areas other than fish culture. The training of the extension agents should include more emphasis on the multiple use and development of water resources, small scale livestock production and the integration of activities as part of a farm plan.

The proposed intensification of data collection will require that a training program be held for volunteers and promoters as to the importance of collecting data and how it will be used. Each record keeping system should be gone over in detail describing exactly the type information to be collected giving the units in which it is to be recorded. This program should be conducted in January of 1987.

The CARE staff should conduct the data collection training program with the Water Harvesting/Aquaculture project assisting in finalizing the questionnaires and the data management. The WHAP could assist CARE in other training as it related to integrated systems.

Credit Program

A credit program should be limited and credit policy should be developed carefully. Credit could be administered through production associations. Credit limits should be developed based on variable input cash needs and size of operation. For example, first cycle could be subsidized, then credit limit set at 50% of cash needs thereafter. Specific credit policy should be developed for each production system (i.e. fish, fish-layers, fish-broilers, fish-pigs, etc).

Suggested credit limits per 100 m^2 pond area are as follows:

1. fish-layers - Q50.
2. fish-broilers - Q30.
3. fish - Q25.

These recommendations are based on cash need calculations presented in Appendix B and are approximately one-half of total cash needs. These calculations are intended as examples and should be revised based on adjustments in production practices. Also, cash needs for pig systems are not presented due to their high level. Feed for a confined pig could easily reach Q1000. It is not recommended that CARE get involved in such large credit outlays. Cash needs can be reduced to the extent of foraging and feed substitution with local feedstuff.

Production Associations

The establishment of production associations of local farmers active in the project is an activity programmed for the next phase of the project. Production associations could be useful for:

1. credit
2. input distribution (fingerlings, feed, fertilizer, vaccinations, etc.)
3. information exchange
4. market coordination (consistent quality, quantity and timing).

Promoters and PCV's should assist in initiating, then slowly allow participants to take over. There will be a need for someone who can handle bank accounts, purchase and sell inputs, and a "salesman" to assist market development.

FOOTNOTES

[1] Anáyesis de los Problemas de Nutrición de la Población de Guatemala, INCAP, National Council for Economic Planning, 1977.

[2] Exchange rates during the period of study were $1.00 U.S. = Q2.50.

APPENDIX A

SUGGESTED DATABASE STRUCTURES FOR FISH INPUT, FISH OUTPUT, ANIMAL INPUT AND OUTPUT, AND GENERAL POND DATA FILE.

(The following data bases are suggested as the types of information to be collected and formats for recording it on the microcomputer. Questionnaires would need to be developed by CARE to provide the information required for the data base. These questionnaires would be used by the PCV to describe the farmers and the production. Production related questionnaires would be completed monthly by the volunteer and submitted to CARE. Care would be responsible for recording the information into the data base.)

Structure for database: C:FISHIN.dbf (FISH POND INPUT FILE)

Number of data records: 0

Date of last update : 12/04/86

Field	Field Name	Type	Width	Dec
1	PONDNUMBER	Numeric	9	
2	CYCLE	Numeric	3	
3	STOCK_DATE	Date	8	
4	REPORTDATE	Date	8	
5	TIL_WEIGHT	Numeric	3	
6	TIL_NUMBER	Numeric	3	
7	TIL_SOURCE	Numeric	1	
8	TIL_DATE	Date	8	
9	CRP_WEIGHT	Numeric	3	
10	CRP_NUMBER	Numeric	3	
11	CRP_SOURCE	Numeric	1	
12	CRP_DATE	Date	8	
13	GUA_WEIGHT	Numeric	3	
14	GUA_NUMBER	Numeric	3	
15	GUA_SOURCE	Numeric	1	
16	GUA_DATE	Date	8	
17	CRL_WEIGHT	Numeric	3	
18	CRL_NUMBER	Numeric	3	
19	CRL_SOURCE	Numeric	1	
20	CRL_DATE	Date	8	
21	FREQ1	Numeric	2	
22	WEIGHT1	Numeric	3	
23	TYPE1	Numeric	1	
24	PRICE1	Numeric	4	2
25	FREQ2	Numeric	2	
26	WEIGHT2	Numeric	3	
27	TYPE2	Numeric	1	
28	PRICE2	Numeric	4	2
29	FREQ3	Numeric	2	
30	WEIGHT3	Numeric	3	
31	TYPE3	Numeric	1	
32	PRICE3	Numeric	4	2
33	WEIGHT4	Numeric	3	
34	TYPE4	Numeric	1	
35	WEIGHT5	Numeric	3	
36	TYPE5	Numeric	1	
37	WEIGHT6	Numeric	1	
38	TYPE6	Numeric	3	
39	WEIGHT7	Numeric	1	
40	TYPE7	Numeric	3	
41	WEIGHT8	Numeric	1	
42	TYPE8	Numeric	3	
43	TYPE9	Numeric	1	
44	HOURS9	Numeric	3	
45	TYPE10	Numeric	1	
46	HOURS10	Numeric	3	
47	TYPE11	Numeric	1	
48	HOURS11	Numeric	3	

Structure for database: C:FISHIN.dbf (FISH POND INPUT FILE)

Field	Field Name	Type	Width	Dec
49	TYPE12	Numeric	1	
50	HOURS12	Numeric	3	
51	TYPE13	Numeric	1	
52	HOURS13	Numeric	3	
53	TYPE14	Numeric	1	
54	HOURS14	Numeric	3	
55	TYPE15	Numeric	2	
56	DOLLARS15	Numeric	5	2
57	TYPE16	Numeric	2	
58	DOLLARS16	Numeric	5	.2
59	TYPE17	Numeric	2	
60	DOLLARS17	Numeric	5	2
** Total **			149	

Codebook for database: C:FISHIN.DBF

(FISH POND INPUT FILE)

ITEM	CODE	Field Name/ Type/Width/Dec
POND IDENTIFICATION INFORMATION		
1. Pond identification number.		PONDNUMBER/N/9
2. Production cycle number	Number each production cycle consecutively, and each monthly for a cycle will have the same cycle number.	CYCLE/N/3
3. Date of initial stocking.	Code month number:	STOCK_DATE/D/8
4. Date of report.	Date in mm/dd/yy format	REPORTDATE/D/8
POND STOCKING INFORMATION		
TILAPIA		
5. Pounds of tilapia stocked.	Pounds	TIL_WEIGHT/N/3
6. Number of tilapia stocked.	Number	TIL_NUMBER/N/3
7. Source for tilapia.	Develop code as needed. For example: 1 = Fisheries Station 2 = Own nursery pond 3 = Another farmer 4 = 5 =	TIL_SOURCE/N/1
8. Date stocked tilapia.	Date in mm/dd/yy format.	TIL_DATE/D/8

Codebook for database: C:FISHIN.DBF

ITEM	CODE	Field Name/ Type/Width/Dec
CARP		
9. Pounds of carp stocked.	Pounds	CRP_WEIGHT/N/3
10. Number of carp stocked.	Number	CRP_NUMBER/N/3
11. Source for carp.	Develop code as needed. For example: 1 = Fisheries Station 2 = Own nursery pond 3 = Another farmer 4 = 5 =	CRP_SOURCE/N/1
12. Date stocked carp.	Date in mm/dd/yy format	CRP_DATE/D/8
GUAPOTE		
13. Pounds of guapote stocked.	Pounds	GUA_WEIGHT/N/3
14. Number of guapote stocked.	Number	GUA_NUMBER/N/3
15. Source for guapote.	Develop code as needed. For example: 1 = Fisheries Station 2 = Own nursery pond 3 = Another farmer 4 = 5 =	GUA_SOURCE/N/1
16. Date stocked guapote.	Date in mm/dd/yy format	GAU_DATE/D/8
CARACOL		
17. Pounds of caracol stocked.	Pounds	CRL_WEIGHT/N/3

Codebook for database: C:FISHIN.DBF

ITEM		CODE	Field Name/ Type/Width/Dec
18.	Number of caracol stocked.	Number	CRL_NUMBER/N/3
19.	Source for caracol.	Develop code as needed. For example: 1 = Fisheries Station 2 = Own nursery pond 3 = Another farmer 4 = 5 =	CRL_SOURVE/N/1
20.	Date stocked caracol.	Date in mm/dd/yy format	CRL_DATE/D/8
		FEED INFORMATION	
PURCHASED FEED			
Type 1:			
21.	Frequency of purchases	Code number of times/week.	FREQ1/N/2
22.	Weight of feed purchased.	Pounds purchased.	WEIGHT1/N/3
23.	Type feed purchased.	Develop code as needed. For example: 1 = commercial fish feed 2 = commerical chicken feed 3 = ...	TYPE1/N/1
24.	Price per pound.	Quetzales per pound.	PRICE1/N/4/2
Type 2:			
25.	Frequency of purchases	Code number of times/week.	FREQ2/N/2
26.	Weight of feed purchased.	Pounds purchased.	WEIGHT2/N/3

Codebook for database: C:FISH14.DBF

ITEM	CODE	Field Name/ Type/Width/Dec
27. Type feed purchased.	Develop code as needed. For example: 1 = commercial fish feed 2 = commerical chicken feed 3 = ...	TYPE2/N/1
28. Price per pound.	Quetzales per pound.	PRICE2/N/4/2
Type 3:		
29. Frequency of purchases	Code number of times/week.	FREQ3/N/2
30. Weight of feed purchased.	Pounds purchased.	WEIGHT3/N/3
31. Type feed purchased.	Develop code as needed. For example: 1 = commercial fish feed 2 = commerical chicken feed 3 = ...	TYPE3/N/1
32. Price per pound.	Quetzales per pound.	PRICE3/N/4/2
LOCAL FEEDS		
Type 1:		
33. Weight of feed.	Pounds.	WEIGHT4/N/3
34. Type feed.	Local feed type code. 1 = 2 = 3 = ...	TYPE4/N/1
Type 2:		
35. Weight of feed.	Pounds.	WEIGHT5/N/3
36. Type feed.	Local feed type code. 1 = 2 = 3 = ...	TYPE5/N/1

Codebook for database: C:FISHIN.DBF

ITEM	CODE	Field Name/ Type/Width/Dec
Type 3:		
37. Weight of feed.	Pounds.	WEIGHT6/N/3
38. Type feed.	Local feed type code. 1 = 2 = 3 = ...	TYPE6/N/1

FERTILIZER INFORMATION

Type 1:		
39. Weight of fertilizer.	Pounds.	WEIGHT7/N/3
40. Type fertilizer.	Fertilizer type code. 1 = Chicken manure 2 = Hog manure 3 = ...	TYPE7/N/1
Type 2:		
41. Weight of fertilizer.	Pounds.	WEIGHT8/N/3
42. Type fertilizer.	Fertilizer type code. 1 = Chicken manure 2 = Hog manure 3 = ...	TYPE8/N/1

LABOR

FEEDING

Type 1:		
43. Type labor used for feeding.	Labor Type Code 1 = Family, female 2 = Family, male 3 = Family, children 4 = Hired labor	TYPE9/N/1
44. Time spent feeding.	Code hours/week.	HOURS9/N/4/2

Codebook for database: C:FISHIN.DBF

ITEM	CODE	Field Name/ Type/Width/Dec
Type 2:		
45. Type labor used for feeding.	Labor Type Code 1 = Family, female 2 = Family, male 3 = Family, children 4 = Hired labor	TYPE10/N/1
46. Time spent feeding.	Code hours/week.	HOURS10/N/4/2
MAINTENANCE		
Type 1:		
47. Type labor used for maintenance.	Labor Type Code 1 = Family, female 2 = Family, male 3 = Family, children 4 = Hired labor	TYPE11/N/1
48. Time spent on maintenance.	Code hours/week.	HOURS11/N/3
Type 2:		
49. Type labor used for maintenance.	Labor Type Code 1 = Family, female 2 = Family, male 3 = Family, children 4 = Hired labor	TYPE12/N/1
50. Time spent on maintenance.	Code hours/week.	HOURS12/N/3
HARVEST		
Type 1:		
51. Type labor used for harvesting activities.	Labor Type Code 1 = Family, female 2 = Family, male 3 = Family, children 4 = Hired labor	TYPE13/N/1
52. Time spent on harvest.	Code hours/week.	HOURS13/N/3

Structure for database: B:FISHOUT.dbf (FISH POND OUTPUT FILE)

Number of data records: 0

Date of last update : 12/05/86

Field	Field Name	Type	Width	Dec
1	PONDNUMBER	Numeric	9	
2	CYCLE	Numeric	3	
3	STOCK_DATE	Date	8	
4	REPORTDATE	Date	8	
5	HARVT_TYPE	Numeric	1	
6	HOOK_LINE	Numeric	1	
7	CASTNET	Numeric	1	
8	SEINE	Numeric	1	
9	NO_TIL	Numeric	5	
10	LBS_TIL	Numeric	4	
11	HC_TIL	Numeric	4	2
12	GIFT_TIL	Numeric	4	2
13	SOLD_TIL	Numeric	4	2
14	PRICE_TIL	Numeric	4	2
15	NO_CRP	Numeric	5	
16	LBS_CRP	Numeric	4	
17	HC_CRP	Numeric	4	2
18	GIFT_CRP	Numeric	4	2
19	SOLD_CRP	Numeric	4	2
20	PRICE_CRP	Nmerric	4	2
21	NO_GUA	Numeric	5	
22	LBS_GUA	Numeric	4	
23	HC_GUA	Numeric	4	2
24	GIFT_GUA	Numeric	4	2
25	SOLD_GUA	Numeric	4	2
26	PRICE_GUA	Numeric	4	2
27	NO_CRL	Numeric	5	
28	LBS_CRL	Numeric	4	
29	HC_CRL	Numeric	4	2
30	GIFT_CRL	Numeric	4	2
31	SOLD_CRL	Numeric	4	2
32	PRICE_CRL	Numeric	4	2
33	T1_NO	Numeric	3	
34	T1_WEIGHT	Numeric	3	
35	T1_SIZE	Numeric	3	
36	T2_NO	Numeric	3	
37	T2_WEIGHT	Numeric	3	
38	T2_SIZE	Numeric	3	
39	T3_NO	Numeric	3	
40	T3_WEIGHT	Numeric	3	
41	T3_SIZE	Numeric	3	
42	CRP_NO	Numeric	3	
43	CRP_WEIGHT	Numeric	3	
44	CRP_SIZE	Numeric	3	
45	GUA_NO	Numeric	3	
46	GUA_WEIGHT	Numeric	3	
47	GUA_SIZE	Numeric	3	
48	CRL_NO	Numeric	3	

Structure for database: B:FISHOUT.DBF (FISH POND OUTPUT FILE)

Field	Field Name	Type	Width	Dec
49	CRL_WEIGHT	Numeric	3	
50	CRL_SIZE	Numeric	3	
51	TIL_REPRO	Numeric	1	
52	CRP_REPRO	Numeric	1	
53	GUA_REPRO	Numeric	1	
54	CRL_REPRO	Numeric	1	
** Total **			169	

Codebook for database: B:FISHOUT.dbf

(FISH POND OUTPUT FILE)

ITEM	CODE	Field Name/ Type/Width/Dec
	POND IDENTIFICATION INFORMATION	
1. Pond identification number.		PONDNUMBER/N/9
2. Production cycle number	Number each production cycle consecutively, and each monthly for a cycle will have the same cycle number.	CYCLE/N/3
3. Date of initial stocking.	Code month number:	STOCK_DATE/D/8
4. Date of report.	Date report filed in mm/dd/yy format.	REPORTDATE/D/8
	HARVEST DATA	
5. Type harvest.	Harvest Code 1 = Partial harvest 2 = Complete havest	HARVT_TYPE/N/1
HARVEST EQUIPMENT		
6. Used hook and line?	Equipment Code Use 1 = Yes 2 = No	HOOK_LINE/N/1
7. Used cast net?	Equipment Code Use 1 = Yes 2 = No	CASTNET/N/1
8. Used seine?	Equipment Code Use 1 = Yes 2 = No	SEINE/N/1

Codebook for database: B:FISHOUT.dbf

ITEM	CODE	Field Name/ Type/Width/Dec
TILAPIA		
9. Number harvested.	Number of tilapia.	NO_TIL/N/5
10. Pounds harvested.	Pounds of tilapia.	LBS_TIL/N/4
11. Amount of total pounds used for home consumption.	Percent.	HC_TIL/N/4/2
12. Amountoftotal pounds tilapia given away.	Percent	GIFT_TIL/N/4/2
13. Amount of total pounds tilapia sold.	Percent	SOLD_TIL/N/4/2
14. Price at which tilapia sold.	In quetzales.	PRICE_TIL/N/4/2
CARP		
15. Number harvested.	Number of carp.	NO_CRP/N/5
16. Pounds harvested.	Pounds of carp.	LBS_CRP/N/4
17. Amount of total pounds used for home consumption.	Percent.	HC_CRP/N/4/2
18. Amountoftotal pounds given away.	Percent	GIFT_CRP/N/4/2
19. Amount of total pounds sold.	Percent	SOLD_CRP/N/4/2
20. Price at which carp sold.	In quetzales.	PRICE_CRP/N/4/2

Codebook for database: B:FISHOUT.dbf

ITEM	CODE	Field Name/ Type/Width/Dec
GUAPOTE		
21. Number harvested.	Number of guapote.	NO_GUA/N/5
22. Pounds harvested.	Pounds of guapote.	LBS_GUA/N/4
23. Amount of total pounds used for home consumption.	Percent.	HC_GUA/N/4/2
24. Amountoftotal pounds given away.	Percent.	GIFT_GUA/N/4/2
25. Amount of total pounds sold.	Percent.	SOLD_GUA/N/4/2
26. Price at which guapote sold.	In quetzales.	PRICE_GUA/N/4/2
CARACOL		
27. Number harvested.	Number of caracol.	NO_CRL/N/5
28. Pounds harvested.	Pounds of caracol.	LBS_CRL/N/4
29. Amount of total pounds used for home consumption.	Percent.	HC_CRL/N/4/2
30. Amountoftotal pounds given away.	Percent.	GIFT_CRL/N/4/2
31. Amount of total pounds sold.	Percent.	SOLD_CRL/N/4/2
32. Price at which caracol sold.	In quetzales.	PRICE_CRL/N/4/2

Codebook for database: B:FISHOUT.dbf

ITEM	CODE	Field Name/ Type/Width/Dec
	SAMPLING DATA	
NOTE:	**INCLUDE THE FINAL HARVEST)**	
TILAPIA -- CATEGORY 1 (	**)**	
33. Number.	Enter number of fish.	T1_NO/N/3
34. Weight per fish	Grams.	T1_WEIGHT/N/
35. Size of fish.	Size in centimeters.	T1_SIZE/N/3
TILAPIA -- CATEGORY 2 (	**)**	
36. Number.	Enter number of fish.	T2_NO/N/3
37. Weight per fish	Grams.	T2_WEIGHT/N/3
38. Size of fish.	Size in centimeters.	T2_SIZE/N/3
TILAPIA -- CATEGORY 3 (	**)**	
39. Number.	Enter number of fish.	T3_NO/N/3
40. Weight per fish	Grams.	T3_WEIGHT/N/3
41. Size of fish.	Size in centimeters	T3_SIZE/N/3
CARP		
42. Number.	Enter number of fish.	CRP_NO/N/3
43. Weight per fish	Grams.	CRP_WEIGHT/N/3
44. Size of fish.	Size in centimeters.	CRP_SIZE/N/3

Codebook for database: B:FISHOUT.dbf

ITEM	CODE	Field Name/ Type/Width/Dec
GUAPOTE		
45. Number.	Enter number of fish.	GUA_NO/N/3
46. Weight per fish	Grams.	GUA_WEIGHT/N/3
47. Size of fish.	Size in centimeters.	GUA_SIZE/N/3
CARACOL		
48. Number.	Enter number of snails.	CRL_NO/N/3
49. Weight per fish	Grams.	CRL_WEIGHT/N/3
50. Size of fish.	Size in centimeters.	CRL_SIZE/N/3
	REPRODUCTION DATA	
51. Are the tilapia reproducting?	1 = yes 2 = no	TIL_REPRO/N/1
52. Are the carp reproducting?	1 = yes 2 = no	CRP_REPRO/N/1
53. Are the guapote reproducting?	1 = yes 2 = no	GUA_REPRO/N/1
54. Are the caracol reproducing?	1 = yes 2 = no	CRL_REPRO/N/1

Structure for database: b:GENPOND.DBF (PERMANENT GENERAL POND DATA FILE)

Number of data records: 0

Date of last update : 12/09/86

Field	Field Name	Type	Width	Dec
1	PONDNUMBER	Numeric	9	
2	PONDAREA	Numeric	4	
3	FARMAREA	Numeric	5	
4	SITE	Numeric	2	
5	REIGION	Numeric	2	
6	CLIMATE	Character	2	
7	ELEVATION	Character	2	
8	YR_CONSTRN	Numeric	2	
9	IRRIGATION	Numeric	1	
10	SLOPE	Numeric	3	
11	SOILTYPE	Numeric	2	
12	H2O VOLUME	Numeric	4	
13	CROP1	Numeric	2	
14	CROP2	Numeric	2	
15	CROP3	Numeric	2	
16	CROP4	Numeric	2	
17	ANIMAL1	Numeric	2	
18	ANIMAL2	Numeric	2	
19	ANIMAL3	Numeric	2	
20	MANAGER	Character	30	
21	AGE	Numeric	2	
22	EXPERIENCE	Numeric	2	
23	INCOME	Numeric	4	
24	OFFFARMINC	Numeric	4	
25	PERSONS	Numeric	2	
26	FAMILIES	Numeric	2	
27	OWNERSHIP	Numeric	2	
28	EDUCATION	Numeric	2	
29	ETHNIC	Numeric	2	
30	PVC	Numeric	5	2
31	CEMENT	Numeric	5	2
32	POLYDUCT	Numeric	5	2
33	LABOR	Numeric	5	2
34	WIRE	Numeric	5	2
35	OTHER	Numeric	5	2
36	NETS	Numeric	5	2
37	SEINS	Numeric	5	2
38	WS_PVC	Numeric	5	2
39	WS_POLYDUC	Numeric	5	2
40	CHICK_WIRE	Numeric	5	2
41	CHICK_WOOD	Numeric	5	2
42	PIG_WIRE	Numeric	5	2
43	PIG_WOOD	Numeric	5	2
44	PIG_CEMENT	Numeric	5	2
** Total **			171	

Codebook for database: B:GENPOND.dbf

(PERMANENT GENERAL FISH POND FILE)

ITEM	CODE	Field Name/ Type/Width/Dec
	POND AND ENVIRONMENTAL DATA	
1. Pond number.		PONDNUMBER/N/3
2. Pond area.	In meters squared.	PONDAREA/N/4
3. Farm area.	In meters squared.	FARMAREA/N/5
4. Pond site.	Develop code as needed. 1 = 2 = 3 =	SITE/N/2
5. Region in which pond is located.	Develop code as needed. 1 = 2 = 3 =	REGION/N/2
6. Climate classification for this pond site.	Develop code as needed. 1 = 2 =	CLIMATE/N/2
7. Elevation at pond site.	Elevation code. 1 = less than 5000 meters 2 = 5000 - 10,000 meters 3 = 10,001 - 12,000 meters 4 = 12,001 - 13,000 meters 5 = ...	ELEVATION/N/2
8. Year the pond was constructed.	Code last two digits.	YR_CONSTRN/N/2
9. Is the pond used for irrigation?	1 = yes 2 = no	IRRIGATION/N/1
10. Slope of land on which pond is located.	Percent slope.	SLOPE/N/4/2

Codebook for database: B:GENPOND.dbf

ITEM	CODE	Field Name/ Type/Width/Dec
11. Soil type at pond site.	Develop code as needed. 1 = 2 = 3 = 4 =	SOILTYPE/N/2
12. Volume of water available.	Cubic meters.	H2O_VOLUME/N/4
	IMPORTANT CROPS	
13. First important crop	Develop code as needed. 1 = corn 2 = ...	CROP1/N/2
14. Second important crop	Use code above.	CROP2/N/2
15. Third important crop	Use code above.	CROP3/N/2
16. Fourth important crop	Use code above.	CROP4/N/2
	IMPORTANT LIVESTOCK	
17. First important animal.	Develop code as needed. 1 = pigs 2 = broilers 3 = layers 4 = ...	ANIMAL1/N/2
18. Second important animal.	Develop code as needed.	ANIMAL2/N/2
19. Third important animal.	Develop code as needed.	ANIMAL3/N/2
	MANAGER DATA	
20. Manager's name.		MANAGER/C/30
21. Manager's age.	In years.	AGE/N/2

Codebook for database: B:GENPOND.dbf

ITEM		CODE	Field Name/ Type/Width/Dec
22.	Farming experience.	In years.	EXPERIENCE/N/2
23.	Annual income of manager.	Quetzales per annum.	INCOME/N/4
24.	Off farm income.	Quetzales per annum.	OFFFARMINC/N/4
25.	Persons in family.	Number of persons.	PERSONS/N/2
26.	Families using the pond.	Number code as needed.	SLOPE/N/2
27.	Pond ownership.	Develop code as needed.	OWNERSHIP/N/2
28.	Education of the owner.	Years of education.	EDUCATION/N/2
29.	Ethnic classification of pond operator.	Develop code as needed. 1 = Indian 2 = 3 =	ETHNIC/N/3

INITIAL CONSTRUCTION COSTS

30.	Cost of PVC pipe used in initial construction.	Cost in Quetzales.	PVC/N/5/2
31.	Cost of cement used in initial construction.	Cost in Quetzales.	CEMENT/N/5/2
32.	Cost of polyduct used in initial construction.	Cost in Quetzales.	POLYDUCT/N/5/2
33.	Cost of labor used in initial construction.	Cost in Quetzales.	LABOR/N/5/2
34.	Cost of wire used in in initial construction.	Cost in Quetzales.	WIRE/N/5/2

Codebook for database: B:GENPOND.dbf

ITEM	CODE	Field Name/ Type/Width/Dec
35. Other construction costs.	Cost in Quetzales.	OTHER/N/5/2
	INITIAL PRODUCTION EQUIPMENT COSTS	
36. Cost of nets.	Cost in Quetzales.	NETS/N/5/2
37. Cost of seins.	Cost in Quetzales.	SEINS/N/5/2
	INITIAL CONSTRUCTION COSTS FOR WATER SOURCE	
38. Costs of PVC pipe for water source.	Cost in Quetzales.	WS_PVC/N/5/2
39. Costs of polyduct for water source.	Cost in Quetzales.	WS_POLYDUC/N/5/2
40. Cost of chicken wire for constructing coop.	Cost in Quetzales.	CHICK_WIRE/N/5/2
	INITIAL CONSTRUCTION COSTS FOR CHICKEN COOP	
41. Cost of wood for construction coop.	Cost in Quetzales.	CHICK_WOOD/N/5/2
	INITIAL CONSTRUCTION COSTS FOR PIG STY	
42. Cost of wire for constructing pig sty.	Cost in Quetzales.	PIG_WIRE/N/5/2
43. Cost of wood for construction pig sty.	Cost in Quetzales.	PIG_WOOD/N/5/2
44. Cost of cement for constructing pig sty.	Cost in Quetzales.	PIG_CEMENT/N/5/2

Structure for database: b:GPONDMO.DBF (GENERAL POND DATA -- MONTHLY FILE)

Structure for database: b:gpondmo.dbf

Number of data records: 0

Date of last update : 12/16/86

Field	Field Name	Type	Width	Dec
1	PONDNUMBER	Numeric	9	
2	CYCLE	Numeric	3	
3	STOCK_DATE	Date	8	
4	REPORTDATE	Date	8	
5	TYPE1	Numeric	2	
6	AREA1	Numeric	3	
7	YIELD1	Numeric	3	
8	HAR1_DATE	Date	8	
9	SOLD1	Numeric	4	2
10	TYPE2	Numeric	2	
11	AREA2	Numeric	3	
12	YIELD2	Numeric	3	
13	HAR2_DATE	Date	8	
14	SOLD2	Numeric	4	2
15	TYPE3	Numeric	2	
16	AREA3	Numeric	3	
17	YIELD3	Numeric	3	
18	HAR3_DATE	Date	8	
19	SOLD3	Numeric	4	2
20	TYPE4	Numeric	2	
21	AREA4	Numeric	3	
22	YIELD4	Numeric	3	
23	HAR4_DATE	Date	8	
24	SOLD4	Numeric	4	2
25	TYPE5	Numeric	2	
26	AREA5	Numeric	3	
27	YIELD5	Numeric	3	
28	HAR5_DATE	Date	8	
29	SOLD5	Numeric	4	2
30	TYPE6	Numeric	2	
31	AREA6	Numeric	3	
32	YIELD6	Numeric	3	
33	HAR6_DATE	Date	8	
34	SOLD6	Numeric	4	2
35	GARDENAREA	Numeric	5	
36	TYPE7	Numeric	2	
37	NUMBER7	Numeric	3	
38	LBS7	Numeric	3	
39	SOLD7	Numeric	4	2
40	TYPE8	Numeric	2	
41	NUMBER8	Numeric	3	
42	LBS8	Numeric	3	
43	SOLD8	Numeric	4	2
44	TYPE9	Numeric	2	
45	NUMBER9	Numeric	3	

Structure for database: b:GPONDMO.DBF (GENERAL POND DATA -- MONTHLY FILE)

Field	Field Name	Type	Width	Dec
46	LBS9	Numeric	3	
47	SOLD9	Numeric	4	2
48	TYPE10	Numeric	2	
49	NUMBER10	Numeric	3	
50	LBS10	Numeric	3	
51	SOLD10	Numeric	4	2
52	TF1_WEIGHT	Numeric	3	
53	TF1_NUMBER	Numeric	4	
54	TF2_WEIGH	Numeric	3	
55	TF2_NUMBER	Numeric	4	
56	CRP_WEIGHT	Numeric	3	
57	CRP_NUMBER	Numeric	4	
58	GUA_WEIGHT	Numeric	3	
59	GUA_NUMBER	Numeric	4	
60	CRL_WEIGHT	Numeric	3	
61	CRL_NUMBER	Numeric	4	
62	TIL_SOLD	Numeric	4	
63	TIL_QUETZA	Numeric	5	2
64	TIL_HC	Numeric	3	
65	TIL_GIFT	Numeric	3	
66	CRP_SOLD	Numeric	4	
67	CRP_QUETZA	Numeric	5	2
68	CRP_HC	Numeric	3	
69	CRP_GIFT	Numeric	3	
70	GUA_SOLD	Numeric	4	
71	GUA_QUETAZ	Numeric	5	2
72	GUA_HC	Numeric	3	
73	GUA_GIFT	Numeric	3	
74	CRL_SOLD	Numeric	4	
75	CRL_QUETZA	Numeric	5	2
76	CRL_HC	Numeric	3	
77	CRL_GIFT	Numeric	3	
78	TIL_AGE	Numeric	2	
79	TIL_LENGTH	Numeric	2	
80	TIL_MIN	Numeric	2	
81	TIL_MAX	Numeric	2	
82	TIL_WT	Numeric	3	
83	CRP_AGE	Numeric	2	
84	CRP_LENGTH	Numeric	2	
85	CRP_MIN	Numeric	2	
86	CRP_MAX	Numeric	2	
87	CRP_WT	Numeric	3	
88	GUA_AGE	Numeric	2	
89	GUA_LENGTH	Numeric	2	
90	GUA_MIN	Numeric	2	
91	GUA_MAX	Numeric	2	
92	GUA_WT	Numeric	3	
93	CRL_AGE	Numeric	2	
94	CRL_LENGTH	Numeric	2	
95	CRL_MIN	Numeric	2	
96	CRL_MAX	Numeric	2	

Structure for database: b:GPONDMO.DBF (GENERAL POND DATA -- MONTHLY FILE)

Field	Field Name	Type	Width	Dec
97	CRL_WT	Numeric	3	
98	PVC	Numeric	5	2
99	CEMENT	Numeric	5	2
100	POLYDUCT	Numeric	5	2
101	LABOR	Numeric	5	2
102	WIRE	Numeric	5	2
103	OTHER	Numeric	5	2
104	NETS	Numeric	5	2
105	SEINES	Numeric	5	2
106	WS_PVC	Numeric	5	2
107	WS_POLYDUC	Numeric	5	2
108	CHICK_WIRE	Numeric	5	2
109	CHICK_WOOD	Numeric	5	2
110	PIG_WIRE	Numeric	5	2
111	PIG_WOOD	Numeric	5	2
112	PIG_CEMENT	Numeric	5	2
** Total **			416	

Codebook for database: B:GPONDMO.DBF

(MONTHLY GENERAL FISH POND FILE)

ITEM	CODE	Field Name/ Type/Width/Dec
POND AND ENVIRONMENTAL DATA		
1. Pond number.		POINUMBER/N/3
2. Production cycle number.	Number each production cycle consecutively, and each monthly record for a pond will have the same cycle number.	CYCLE/N/3
3. Date pond stocked.	Date in mm/dd/yy format.	STOCK_DATE/D/8
4. Date of this report.	Date in mm/dd/yy format.	REPORTDATE/D/8
CROP DATA		
First crop		
5. Type crop.	Develop code as needed, include unit for yield. For example, 1 = corn, bushels	TYPE1/N/2
6. Area devoted to this crop.	Area in square meters.	AREA1/N/3
7. Yield for this crop.	In units from code above.	YIELD1/N/3
8. Harvest date.	Date in mm/dd/yy format.	HARI_DATE/D/8
9. Amount of crop that was sold.	Per cent of total yield.	SOLD1/N/4/2
Second crop		
10. Type crop.	Develop code as needed, include unit for yield. For example, 1 = corn, bushels	TYPE2/N/2

Codebook for database: B:GPONDM0.DBF

ITEM		CODE	Field Name/ Type/Width/Dec
11.	Area devoted to this crop.	Area in square meters.	AREA2/N/3
12.	Yield for this crop.	In units in code above.	YIELD2/N/3
13.	Harvest date.	Date in mm/dd/yy format.	HAR2_DATE/D/8
14.	Amount of crop that was sold.	Per cent of total yield.	SOLD2/N/4/2
Third crop			
15.	Type crop.	Develop code as needed, include unit for yield. For example, 1 = corn, bushels	TYPE3/N/2
16.	Area devoted to this crop.	Area in square meters.	AREA3/N/3
17.	Yield for this crop.	In units from code above.	YIELD3/N/3
18.	Harvest date.	Date in mm/dd/yy format.	HAR3_DATE/D/8
19.	Amount of crop that was sold.	Per cent of total yield.	SOLD3/N/4/2
Fourth crop			
20.	Type crop.	Develop code as needed, include unit for yield. For example, 1 = corn, bushels	TYPE4/N/2
21.	Area devoted to this crop.	Area in square meters.	AREA4/N/3

Codebook for database: B:GPONDMO.DBF

ITEM		CODE	Field Name/ Type/Width/Dec
22.	Yield for this crop.	In units from code above.	YIELD4/N/3
23.	Harvest date.	Date in mm/dd/yy format.	HAR4_DATE/D/8
24.	Amount of crop that was sold.	Per cent of total yield.	SOLD4/N/4/2
Fifth crop			
25.	Type crop.	Develop code as needed, include unit for yield. For example, 1 = corn, bushels	TYPE5/N/2
26.	Area devoted to this crop.	Area in square meters.	AREA5/N/3
27.	Yield for this crop.	In units from code above.	YIELD5/N/3
28.	Harvest date.	Date in mm/dd/yy format.	HAR5_DATE/D/8
29.	Amount of crop that was sold.	Per cent of total yield.	SOLD5/N/4/2
Sixth crop			
30.	Type crop.	Develop code as needed, include unit for yield. For example, 1 = corn, bushels	TYPE6/N/2
31.	Area devoted to this crop.	Area in square meters.	AREA6/N/3
32.	Yield for this crop.	In units from code above.	YIELD6/N/3
33.	Harvest date.	Date in mm/dd/yy format.	HAR6_DATE/D/8

Codebook for database: B:GPONDMO.DBF

ITEM		CODE	Field Name/ Type/Width/Dec
34.	Amount of crop that was sold.	Per cent of total yield.	SOLD6/N/4/2
35.	Total land area used for garden crops.	Square meters.	GARDENAREA/N/5
		ANIMAL DATA	
First animal			
36.	Type animal.	Animal type code. 1 = broilers 2 = layers 3 = pigs 4 = ...	TYPE7/N/2
37.	Animals stocked.	Number of animals.	NUMBER7/N/3
38.	Animals harvested.	Pounds.	LBS7/N/3
39.	Animals sold.	Percent of total pounds.	SOLD7/N/4/2
Second animal			
40.	Type animal.	Animal type code. 1 = broilers 2 = layers 3 = pigs 4 = ...	TYPE8/N/2
41.	Animals stocked.	Number of animals.	NUMBER8/N/3
42.	Animals harvested.	Pounds.	LBS8/N/3
43.	Animals sold.	Percent of total pounds.	SOLD8/N/4/2

Codebook for database: B:GPONDM0.DBF

ITEM	CODE	Field Name/ Type/Width/Dec
Third animal		
44. Type animal.	Animal type code. 1 = broilers 2 = layers 3 = pigs 4 = ...	TYPE9/N/2
45. Animals stocked.	Number of animals.	NUMBER9/N/3
46. Animals harvested.	Pounds.	LBS9/N/3
47. Animals sold.	Percent of total pounds.	SOLD9/N/4/2
Fourth animal		
48. Type animal.	Animal type code. 1 = broilers 2 = layers 3 = pigs 4 = ...	TYPE10/N/2
49. Animals stocked.	Number of animals.	NUMBER10/N/3
50. Animals harvested.	Pounds.	LBS10/N/3
51. Animals sold.	Percent of total pounds.	SOLD10/N/4/2
	STOCKING DATA	
Small Tilapia (< 50 g)		
52. Weight stocked.	Weight in pounds.	TF1_WEIGHT/N/3
53. Number stocked.	Count.	TF1_NUMBER/N/4

Codebook for database: B:GPONDMO.DBF

ITEM	CODE	Field Name/ Type/Width/Dec
Large Tilapia (50 g and up)		
54. Weight stocked.	Weight in pounds.	TF2_WEIGH/N/3
55. Number stocked.	Count.	TF2_NUMBER/N/4
Carp		
56. Weight stocked.	Weight in pounds.	CRP_WEIGH/N/3
57. Number stocked.	Count.	CRP_NUMBER/N/4
Guapote		
58. Weight stocked.	Weight in pounds.	GUA_WEIGH/N/3
59. Number stocked.	Count.	GUA_NUMBER/N/4
Caracol		
60. Weight stocked.	Weight in pounds.	CRL_WEIGH/N/3
61. Number stocked.	Count.	CRL_NUMBER/N/4
	HARVEST DATA	
Tilapia		
62. Tilapia sold.	Pounds.	TIL_SOLD/N/4
63. Receipts from tilapia sales.	Quetzales.	TIL_QUETZA/N/5/2
64. Tilapia used for home consumption.	Pounds.	TIL_HC/N/3
65. Tilapia given away or used for barter.	Pounds.	TIL_GIFT/N/3

Codebook for database: B:GPONDMO.DBF

ITEM		CODE	Field Name/ Type/Width/Dec
Carp			
66.	Carp sold.	Pounds.	CRP_SOLD/N/4
67.	Receipts from carp sales.	Quetzales.	CRP_QUETZA/N/5/2
68.	Carp used for home consumption.	Pounds.	CRP_HC/N/3
69.	Carp given away or used for barter.	Pounds.	CRP_GIFT/N/3
Guapote			
70.	Guapote sold.	Pounds.	GUA_SOLD/N/4
71.	Receipts from guapote sales.	Quetzales.	GUA_QUETZA/N/5/2
72.	Guapote used for home consumption.	Pounds.	GUA_HC/N/3
73.	Guapote given away or used for barter.	Pounds.	GUA_GIFT/N/3
Caracol			
74.	Caracol sold.	Pounds.	CRL_SOLD/N/4
75.	Receipts from caracol sales.	Quetzales.	CRL_QUETZA/N/5/2
76.	Caracol used for home consumption.	Pounds.	CRL_HC/N/3
77.	Caracol given away or used for barter.	Pounds.	GUA_GIFT/N/3

Codebook for database: B:GPONDM0.D0F

ITEM	CODE	Field Name/ Type/Width/Dec
	SAMPLING DATA	
Tilapia		
78. Approximate age.	Months.	TIL_AGE/N/2
79. Average length.	Centimeters.	TIL_LENGTH/N/3
80. Minimum length.	Centimeters.	TIL_MIN/N/2
81. Maximum length.	Centimeters.	TIL_MAX/N/2
82. Average weight.	Pounds.	TIL_WT/N/3
Carp		
83. Approximate age.	Months.	CRP_AGE/N/2
84. Average length.	Centimeters.	CRP_LENGTH/N/2
85. Minimum length.	Centimeters.	CRP_MAX/N/2
86. Maximum length.	Centimeters.	CRP_MIN/N/2
87. Average weight.	Pounds.	CRP_WT/N/3
Guapote		
88. Approximate age.	Months.	GUA_AGE/N/2
89. Average length.	Centimeters.	GUA_LENGTH/N/2
90. Minimum length.	Centimeters.	GUA_MAX/N/2

Codebook for database: B:GPONDMO.DBF

ITEM		CODE	Field Name/ Type/Width/Dec
91.	Maximum length.	Centimeters.	GUA_MIN/N/2
92.	Average weight.	Pounds.	GUA_WT/N/3
Caracol			
93.	Approximate age.	Months.	CRL_AGE/N/2
94.	Average length.	Centimeters.	CRL_LENGTH/N/2
95.	Minimum length.	Centimeters.	CRL_MAX/N/2
96.	Maximum length.	Centimeters.	CRL_MIN/N/2
97.	Average weight.	Pounds.	CRL_WT/N/3
	REPLACEMENT AND REPAIR/MAINTENANCE COSTS		
Pond			
98.	Cost of PVC for pond repairs or maintenance.	In Quetzales.	PVC/N/5/2
99.	Cost of cement for pond repairs or maintenance.	In Quetzales.	CEMENT/N/5/2
100.	Cost of polyduct for pond repairs or maintenance.	In Quetzales.	POLYDUCT/N/5/2
101.	Cost of labor for pond repairs or maintenance.	In Quetzales.	LABOR/N/5/2
102.	Cost of wire for pond repairs or maintenance.	In Quetzales.	WIRE/N/5/2

Codebook for database: B:GPONDMO.DBF

ITEM		CODE	Field Name/ Type/Width/Dec
103.	Other pond repair or maintenance cost.	In Quetzales.	OTHER/N/5/2
Equipment Additions or Replacement			
104.	Cost of net(s).	In Quetzales.	NETS/N/5/2
105.	Cost of sein(s).	In Quetzales.	SEINES/N/5/2
Water Source			
106.	Cost of PVC pipe for repairs/maintenance.	In Quetzales.	WS_PVC/N/5/2
107.	Cost of Polyduct for repairs/maintenance.	In Quetzales.	WS_POLYDUC/N/5/2
Chicken Coop			
108.	Cost of wire for chicken coop repairs/maintenance.	In Quetzales.	CHICK_WIRE/N/5/2
109.	Cost of wood for chicken coop repairs/maintenance.	In Quetzales.	CHICK_WOOD/N/5/2
Pig Sty			
110.	Cost of wire for pig sty repairs/ maintenance.	In Quetzales.	PIG_WIRE/N/5/2
111.	Cost of wood for pig syt repairs/ maintenance.	In Quetzales.	PIG_WOOD/N/5/2
112.	Cost of cement for pig sty repairs/ maintenance.	In Quetzales.	PIG_CEMENT/N/5/2

Structure for database: b:LAYERS.DBF (MONTHLY LAYER IN/OUTPUT FILE)

Number of data records: 0

Date of last update : 12/16/86

Field	Field Name	Type	Width	Dec
1	POUDNUMBER	Numeric	9	
2	CYCLE	Numeric	3	
3	STOCK_DATE	Date	8	
4	TYPE	Numeric	2	
5	STOCK_DATE	Date	8	
6	NUMBER	Numeric	3	
7	ANIMAL_AGE	Numeric	2	
8	BREED	Numeric	2	
9	SYSTEM	Numeric	2	
10	CONFINEMNT	Numeric	3	
11	DATE1	Date	8	
12	WEIGHT	Numeric	3	
13	TYPE2	Numeric	2	
14	DATE2	Date	8	
15	TYPE3	Numeric	3	
16	DATE3	Date	8	
17	MORTALITY	Numeric	3	
18	CAUSE	Numeric	2	
19	DATE4	Date	8	
20	NO_EGGS	Numeric	3	
21	NO_SOLD	Numeric	3	
22	NO_HC	Numeric	3	
23	END_DATE	Date	8	
24	TOTL_SOLD	Numeric	3	
25	TOTL_WEIGH	Numeric	4	
26	PRICE	Numeric	4	2
27	MARKET	Numeric	2	
28	CITY	Numeric	3	
29	NO_HC	Numeric	3	
30	LBS_HC	Numeric	3	
** Total **			127	

Codebook for database: b:LAYERS.DBF (MONTHLY ANIMAL IN/OUTPUT FILE)

ITEM		CODE	Field Name/ Type/Width/Dec
1.	Pond I.D. number.		PONDNUMBER/N/9
2.	Pond production cycle.	Number each production cycle consecutively, and each monthly record for a pond will have the same cycle number.	CYCLE/N/3
3.	Pond stocking date.	Date pond was stocked in mm/dd/yy format.	STOCK_DATE/D/8
		ANIMAL TYPE DATA	
4.	Type animal stocked.	Develop code as needed. 1 = Layer 2 = Broilers 3 = Pigs 4 = . . .	TYPE/N/2
5.	Date animal stocked.	Date in mm/dd/yy format.	DATE_STOCK/D/8
6.	Animals stocked.	Number.	NUMBER/N/3
7.	Age of animals stocked.	In days.	ANIMAL_AGE/N/2
8.	Breed of animal stocked.	Develop code as needed. 1 = Rhode Island Red 2 = . . .	BREED/N/2
		SYSTEM TYPE DATA	
9.	Type system	Develop code as needed. 1 = . . . 2 = . . .	SYSTEM/N/2
10.	Length of confinement.	Number of days.	CONFINEMNT/N/3

Codebook for database: b:LAYERS.DBF (MONTHLY ANIMAL IN/OUTPUT FILE)

ITEM	CODE	Field Name/ Type/Width/Dec
	SAMPLING DATA	
11. Date sample made.	Date in mm/dd/yy format.	DATE1/D/8
12. Weight of animal.	In pounds.	WEIGHT/N/3
	INOCULATION DATA	
First Inoculation		
13. Type inoculation.	Develop code as needed. 1 = 2 =	TYPE2/N/2
14. Date of inoculation.	Date in mm/dd/yy format.	DATE2/D/8
Second Inoculation		
15. Type inoculation.	Develop code as needed. 1 = 2 =	TYPE3/N/3
16. Date of inoculation.	Date in mm/dd/yy format.	DATE3/D/8
	MORTALITY DATA	
17. Mortalities.	Number of mortalities.	MORTALITY/N/3
18. Cause of mortalities.	Develop code as needed. 1 = Disease 2 = . . .	CAUSE/N/2
	EGG PRODUCTION DATA	
19. Date hens began to produce eggs.	Date in mm/dd/yy format.	DATE4/D/8
20. Eggs produced.	Number of eggs.	NO_EGGS/N/3
21. Eggs sold.	Number of eggs sold.	NO_SOLD/N/3

Codebook for database: b:LAYERS.DBF (MONTHLY ANIMAL IN/OUTPUT FILE)

ITEM		CODE	Field Name/ Type/Width/Dec
22.	Eggs used for home consumption.	Number of eggs.	NO_HC/N/3
23.	Date of end of production	Date in mm/dd/yy format.	END_DATE/D/8
24.	Total sold.	Number sold.	TOTL_SOLD/N/3
25.	Total weight sold.	Pounds.	TOTL_WEIGH/N/4
26.	Price.	Quetzales/pound.	PRICE/N/4/2
27.	Type market.	Develop code as needed.	MARKET/N/2
28.	Location of market.	Develop code as needed.	CITY/N/3
29.	Total used for home consumption.	Number.	HC_NUMBER/N/3
30.	Total weight used for home consumption.	Pounds.	HC_POUNDS/N/3

APPENDIX B

CASH NEEDS FOR FISH, FISH-LAYER AND FISH-BROILER PRODUCTION SYSTEMS.

ndix Table A.1. Cash Needs for Fish-Layer Production Systems
m2, fish 6 month cycle, layers 18 month cycle).

tem	Unit	Quantity	Price/unit	Value/cost
Fish				
Tilapia($1/m^2$)	#	100	.03	3.00
Carp($1/10m^2$)	#	10	.10	1.00
Feed(purchased)	lbs	50	.20	10.00
Maintenance (purchased materials)				5.00
				19.00
Layers	#	12	2.00	24.00
Feed(purchased)	lbs	150	.33	49.50
Medicines				3.00
Maintenance (purchased materials)				5.00
				81.50

pendix Table A.2. Cash Needs for Fish-Broiler Production Systems (100 m2, fish 6 month cycle, broilers 2 month cycle).

Item	Unit	Quantity	Price/unit	Value/cost
Fish				
Tilapia($1/m^2$)	#	100	.03	3.00
Carp($1/10m^2$)	#	10	.10	1.00
Feed(purchased)	lbs	50	.20	10.00
Maintenance (purchased materials)				5.00
				19.00
Broilers($1/4m^2$)	#	25	.70	17.50
Feed(purchased)	lbs	60	.34	20.40
Medicines				3.00
Maintenance (purchased materials)				2.00
				42.90

ɔendix Table A.3. Cash Needs for Fish Production System (100 m2, fish 6 month cycle).

Item	Unit	Quantity	Price/unit	Value/cost
Fish				
Tilapia($1/m^2$)		100	.03	3.00
Carp($1/10m^2$)		10	.10	1.00
Feed(purchased)	lbs	100	.20	20.00
Fertilizer (purchased)	lbs	100	.24	24.00
Maintenance (purchased materials)				5.00
				53.00