



Denny Robinson
Rich Newberg

PO BOX 1077

PK

Africare

"Improving the quality of life in rural Africa through the development of water resources, increased food production and the delivery of health services."

1601 Connecticut Avenue, N.W. Washington, D.C. 20009
Telephone (202) 462-3614 • Telex 64239

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to the United Nations

April 14, 1983

*Mission Action
SWAMP info*

Mr. David Wilson
Director
USAID/Bamako
Bamako, Mali

Re: USAID 688-0220

Dear Mr. Wilson:

Enclosed is the Joint Evaluation Report for the Pilot Fish Production Project/San Mali which was conducted by the Government of Mali and Africare, on February 22 through March 4, 1983.

Africare would appreciate receiving your written reactions, observations or questions regarding this report.

Based upon the discussions with the Mission, Peace Corps and the Government of Mali, we are preparing a proposal for follow-on activities in Fisheries. We plan on submitting the proposal as an OPG to USAID/Mali o/a/ May 1, 1983.

Sincerely,

C. Payne Lucas
C. Payne Lucas
Executive Director

cc: Jonathan McCabe, AID/W
John Zarafonetis, PC/Mali
Eaux et Forets, GOM
Ralph Conley USAID/M

Enclosure

CPL/jp

Executive Director:
C. PAYNE LUCAS

JOINT AFRICARE/GOVERNMENT OF THE REPUBLIC OF MALI

END OF PROJECT EVALUATION

PILOT FISH PRODUCTION PROJECT

SAN, MALI

(No. USAID 688-0220)

Submitted to:

Africare, Inc
1601 Conn.Ave., N.W.
Washington, D.C. 20009

Submitted by:

Henry Van Blake
Consultant
April 16, 1983

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6. G.O.M. San Fisheries Semi Annual Report

I. SUMMARY

This review of the Pilot Fish Production Project No. USAID 688-0220/San, Mali took place 3 years and 3 months after the agreement was signed and is the first evaluation of this Project. The initial study was conducted between 10 June and 12 July, 1978.(1) This much needed project suffered start-up problems with a delayed impact on the achievement of the project goals and objectives. The combined efforts of the PVO(Africare) and the Government of the Republic of Mali (G.O.M.) have resulted in bringing the project to a position where the fullest possibilities can now be exploited, provided the project continues.

In the original Project Paper the log-frame component was not included, however, a number of the outputs as detailed under the Project Design have been accomplished. In addition, enough constraints have been overcome to indicate that most objectives can be achieved.

As a result, it is the recommendation of the evaluation team that the Pilot Fish Production Project No. USAID 688-0220, San, Mali be continued beyond the planned completion date, if certain conditions are met. This major recommendation is offered after a detailed analysis of constraints, the outputs and the components of the project by the evaluation team.

Major findings with respect to the PVO's activities in organizing and implementing the project would support the following:

Most of the delays at the time of start up were discerned to be the lack of communication between the services of Operation Riz, and Eaux et Forêts. In addition, there were frequent changes of the personnel

(1) Inland Fisheries Feasibility Survey, Republic of Mali, 10 June to 12 July, 1978; REA, Clark, Carberry and Touré.

who were concerned with the Project. Africare should have held discussions with all Ministries and Operations involved, jointly and frequently to keep the communications system open. Africare did provide the strongest support and guidance to the Project.

Major Findings with respect to the Peace Corps activities will support the following:

The Peace Corps Volunteers assigned to the Project indicated they had a very narrow and restricted idea of how to execute this project, and Peace Corps/Mali did not appear to be able to influence their negative opinions.

The Project Paper states that the purpose of the project is to promote fish production in the 4th and 5th Regions of Mali. It can be assumed that any feasible method should be used. The Project Paper recommends that all other possibilities such as cage culture in rivers, behind dams or in lakes should be considered. Also, a Peace Corps fish culture extension volunteer and his Malian counterpart will work mainly with rice farmers interested in rice/fish culture. In the P.C.V. report submitted by Schwarts and Pier, after making a survey of the Niono Region looking for pond sites only, they made a statement in their recommendations that the goal of the project is to help Malian farmers grow fish. Then they decided: "As suitable terrain for this project is not available in Mali, We recommend that the Project be terminated".(2)

According to Eaux et Forêts, "les deux Volontaires du Corps de la Paix précédemment installés à Niono, ont pur de raisons non justifiées quitté le project."(3)

(2) US PC/USAID Fish Culture Project, Republic of Mali, final report, 14 June 1982

(3) Rapport Semestriel Circonstancié, janvier à juin 1982, le Chef du Project, A Sanogo

In spite of the foregoing, Peace Corps/Mali was the original motivating force for the Project.

Major Findings with Respect to G.O.M. Activities in Organizing and implementing the Project would support the following:

Eaux et Forêts did not come forward soon enough when the first study was made to demand that the Niono area be investigated for fish culture. The Ministry had personnel stationed there who were well acquainted with the possibilities of the area. Eaux et Forêts helped solve the problems of starting up while supporting the Project and guided it to its present position.

Project Progress to date:

Fish Production: The pilot station at the Village of San has been established and is in operation.

Training: A total of four Malians have been trained to work at the station and in extension services.

Distribution of Fingerlings: An aerated tank is in use transporting fingerlings and a landrover is assigned to the station for use by the extension agents.

Extension Service: Only one extension agent is working with farmers and he is teaching cage fish production.

Studies Made. No studies have been made

Self-Sustaining of the fish station: No efforts have been established to accomplish this.

Record Keeping: Some records were kept of finances; feed supplied; chemical composition of water in the river, canal and ponds; and weights of fish produced.

Recommendations Necessary For A Future Project

All efforts must be made to encourage the Peace Corps to participate in the continuation of fish production.

Eaux et Forêts must be willing to assign more manpower to the Project and train them in Mali. Thus establishing a trained extension force.

Eaux et Forets must require that records be kept regarding the condition of the water on the river, the canals, and the ponds. These examinations will determine the oxygen content, pH, carbon dioxide, microfood and the need for other tests. These must be taken regularly and charted over yearly periods.

Dead fish should be autopsied (using the laboratories at Mopti or CVL in Bamako if necessary); the cause of death being classified and recorded. Ill fish should be sacrificed, the disease diagnosed and recorded. The keeping of these records and charts will be the beginning of practical research and may avoid problems later.

At least one demonstration must take place in San growing fish and rice together. Later, various species should be experimented with in the rice-fish culture. Careful records should be kept on the amounts and kinds of feed used and the cultivation practices employed in rice production.

All efforts must be made to determine the cost benefits of the Project by keeping all records of costs involved in production of mature fish, the production of fingerlings, and the money received at the time of the sale of the products. Cost benefit determinations should be made yearly.

Monies received at San for the sale of the products should remain in a revolving fund at San to insure the sustainability of the Project.

Experiments should be undertaken at San using schistosomiasis consuming fish, ducks, etc., in order to be able to address the control of schistosomiasis.

II. INTRODUCTION AND BACKGROUND

A. Project Background

Mali is a large land-locked west African country of some five million people bordered by Senegal, Mauritania, Algeria, Niger, Upper Volta, Ivory Coast and Guinea. Mali is linked with Dakar, Senegal and the Atlantic ocean by a railroad line built during the colonial era. The Niger River passes through Mali and links the railway with a modest river transport system which is functional from August to January, most years. Half the country lies to the north of the great bend in the Niger River at Timbuctoo and is an economically unproductive desert. No mineral or oil reserves have, as yet, been discovered in Mali. This lack of exportable resources, Mali's land-locked position and harsh Sahelian climate have been factors contributing to Mali's position as one of the least developed countries in the world as measured in economic terms. The per capita gross national product is estimated as ninety dollars per year. Despite these obstacles, Mali has made much progress, and its people have proven that they are determined to create a society which is free from hunger, disease and poverty.

The climate has been capricious in the last decade, and Mali suffered badly from the drought of the early 70's. Traditionally, a cattle and fish exporting country, Mali experienced heavy losses in reserves of both during the drought. Approximately ninety percent of the people in Mali are subsistence farmers, herdsman or river fishermen. The staple crops produced are millet, sorghum and rice. Most villages use traditional methods of agriculture, although a number

of development projects are underway to utilize the waters of the Niger and Senegal Rivers to irrigate lands for farming, thus decreasing the chances of famine created by another drought.

The government of Mali expressed in its most recent Five Year Plan (1974-1978) a desire to meet the basic needs of the population. Stated priorities were to increase production of all agricultural products and to become more economically independent. Mali's soil and climate are far from ideal for agricultural production and although rural villagers eke out a subsistence living through hard work and ingenuity, their diets are based on cereal consumption and lack sufficient protein. Meat and fish are expensive and often unavailable.

Peace Corps has been active in Mali since April, 1971. The first volunteers were involved solely in rural development projects, but subsequent programs have included teachers, health workers, and a variety of specialized technicians. Currently there are more than 50 volunteers who are living and working throughout the country. More than half of the volunteers are involved in assisting rural development or health projects.

Africare, a private volunteer organization (PVO) headquartered in Washington, D. C. since 1971, and with a regional office in Bamako, Mali since 1974, has undertaken a number of programs of rural development in the Sahel. These programs have been in the domains of famine relief, water resources development, rural health, food production and integrated rural development. Africare's permanent representative based in Bamako, worked with representatives of Peace Cors/Mali in the design of this project and in preparing it for implementation by Africare.

B. Project History and Plan

The Pilot Fish Production Project and proposed plan of action grew out of discussions and studies involving the G.O.M., Peace Corps, USAID/Mali and Africare. The Minister of Rural Development and the Director of Eaux et Forêts recognize that the fish reserves in the natural waterways of Mali are dwindling fast because of the drought; use of spawning areas for rice cultivation and use of modern fishing equipment. It is felt that the best opportunity to improve this condition is through designed management of fish production. It is hoped to return fish to the important position, both nutritionally and economically, that it has held historically in Mali. The investigation of a fish culture program emerged from the series of suggested actions.

An intensive study of the fish culture possibilities in the Central Delta Region of the Niger River was conducted by Fisheries Specialist Harry Rea, the Associate Director of Peace Corps/Mali Dague Clark, Fisheries Volunteer Bill Carberry and his Malian counterpart Mamadou Touré. (Appendix 1)

This report was submitted to Eaux et Forêts. The recommendations of this study promulgated the interest of the people and the G.O.M., thus continuing discussions between Peace Corps/Mali, Africare/Mali and USAID/Mali. The result was a proposal submitted by Africare in conjunction with Peace Corps to USAID/Mali.

Africare agreed to administer the grant, the Peace Corps to supply volunteers and USAID to monitor it. Africare works with the Malian and Peace Corps officials at all levels.

It was agreed that the site on which the station at San was to be established was to be provided by Operation Riz. At this point, the original site was changed to one requiring more work and time to clear, thus creating a greater expenditure of funds than was estimated.

Negotiations were made with Operation Riz to keep the water in the intake canal at a level high enough at all times so the fish station could use the water when needed. The agreement broke down because rice needs to be irrigated only three months whereas water is needed for six months to produce mature fish. An agreement could not be reached as to who would pay for the extra three months of pumping.

At the new site it was necessary to construct the ponds on top of the ground to provide adequate drainage. Work began 19 November 1979. Soil was hauled in and walls built. After this construction was started, the construction technician employed by Africare terminated his services, slowing down the progress of the project.

In time, Africare was able to employ the services of another construction technician to finish the ponds and building construction. A consultant engineer found that the composition of the soil used did not contain enough clay, neither had the proper compaction been done to prevent leakages of the ponds. He had both of these problems corrected.

One of the Malian Engineers, Mr. Guimba Diallo, stationed at the San Fisheries Project, guided Mr. Morrison the second construction technician to Niono believing that it was a better site than San for the fish station. They realized that the water at Niono was supplied by gravity versus pumping as at San. Since the water was necessary for sugarcane production as well as rice, there was water in the canals year round. There was enough difference

in the level of the intake canal and the rice flats to allow ponds to be built and to allow the ponds to be filled and drained by gravity.

With the recommendation of Mr. Morrison that the station be established at Niono, construction at San was delayed and discussions began. The PCVs Ms. Pam Schwartz and Mr. Jerome Pier, made a study of the canal and drainage system of the area under the control of Office du Niger. Mr. Lamine M. Traoré, Director for Extension for the fish culture project advised the volunteers that in the canals at Niono were one of the few places in Mali that reliable supplies of water could be found during the entire year. The PCVs made the recommendation that the fish culture project be terminated and departed Mali. (1) Despite these recommendations work resumed at San and the station was completed.

The Malians who were sent to Bouaké for training returned. Fingerlings were imported from Bouaké and fish production began. During this time, the project purchased a used pump because water arrangements had not been worked out with Operation Riz. It malfunctioned most of the time. However, despite these problems, the station was able to bring one group of fingerlings to maturity with some fingerlings remaining. A new pump has been purchased but will require the purchase of new fittings and laying of new pipe to make it functional. Once it is installed, it is expected that most of the water problems will be solved.

(1) U.S.P.C./USAID Fish Culture Project Republic of Mali: Final Report. Submitted by Pam Schwartz and Jerome Pier.

The construction is finished and presently includes 9 ponds, 4 holding tanks, 2 concrete block buildings— office, laboratory, storehouse, and a latrine.

Under this two-year project Peace Corps and Africare proposed to work directly with Malian officials and technicians at the national, regional and local levels and with the village people in order to accomplish the following:

1. establish and operate a pilot station at the village of San for fish breeding, fish production and the hatching and distribution of fingerlings
2. train station and extension staff
3. assist farmers to undertake fish production in conjunction with existing paddy rice production
4. distribute fingerlings to the rice farmers
5. study and recommend improved approaches for fish culture, production and integration with other aspects of rural development
6. assess the self-sustaining potential of the fish station and extension activities
7. prepare a report by the end of year 1 and year 2 on the results obtained, problems encountered, program potentials and shortcomings along with recommendations for future actions.

The project paper submitted jointly by Peace Corps/Mali and Africare/Mali expected the two groups to assist the G.O.M. with a

two-year fisheries project, implemented by Peace Corps Volunteers and Malian agents under the supervision of Eaux et Forêts.

The purpose of the project is to promote fish production in the 4th and 5th regions without endangering existing fish reserves in order to help improve the quality and quantity of protein available for local consumption as well as assist the rural people to add to their cash income.

The methods recommended were:

1. build and exploit fish ponds
2. develop rice/fish culture
3. all other possibilities such as cage culture in rivers, behind dams or in lakes
4. the barrages of the Dogon Plateau should be stocked

The responsibilities of each group were:

1. Peace Corps
 - a. Manage the station at San and oversee all aspects of fish production at the station using volunteers
 - b. Supply necessary volunteers until date that all parties concerned feel the Malians can run all phases of the program. Then turn the project over to the Malians.
 - c. \$78,000 - cost of training the volunteers.
2. Africare
 - a. cooperate with Peace Corps in formulating the project
 - b. manage the project and the grant provided by USAID
3. Government of the Republic of Mali
 - a. provide all Malian counterparts

- b. provide the training of Malians
 - c. provide two hectares of land
 - d. provide insurance and taxes on vehicles
4. USAID/Mali
- a. grant of \$294,000
 - b. monitor the project

Objective of the Evaluation

This report is an end of Term Evaluation of the Pilot Fish Project, San Mali, Project No. USAID 688-0220, that was an operational program grant approved November 1979.

The objective is to evaluate the progress to date toward the achievement of the project objectives and outputs, to objectively identify and examine constraints and to the extent possible, make recommendations to alleviate these constraints.

III METHODOLOGY

A. Planning and Orientation

The team leader was contracted by Africare, Inc., to go Mali and to lead a team on the evaluation of the Africare fisheries project, located in the city of San. In the Africare/W office the team leader was given the history and background of the project. Several reports including the project documents were also made available.

The evaluation began Feb. 22 the day after arrival in Bamako with a briefing by Mr. Ralph Conley, USAID Agriculture Office, in charge of Crops Division, who is monitoring the project. Mr. Qadir Madyun, Africare Country Representative, then escorted the team leader to Eaux et Forêts to meet with Mr. Hinna Haidara, Chief de la Division

Peche. Mr. Haidara explained most of the start-up problems. He emphasized that despite these problems, Eaux et Forêts had the utmost confidence in the possibilities of the project. At this time, we established the work/evaluation schedule.

Mr. Lamine Soumah, Marine Biologist, Africare Consultant to implement Cage fish culture was met later working in the field.

B. Data Collection

The methods of collecting data included the following:

- Reading the project paper, reports, and discussing them with appropriate personnel
- On-site observations
- Discussions with G.O.M., USAID, Peace Corps project personnel and villagers
- Interviews with G.O.M. staff and project beneficiaries (villagers)

In addition to the project paper supplied by Africare/W, other documents were supplied by Peace Corps/Mali, Eaux et Forêts, and Africare/Mali. Interviews were held with the project staff seeking their perceptions, opinions and recommendations. All interviewees were assured that all information would be treated objectively. It was emphasized that the evaluation process is of a constructive nature.

Informal interviewing took place throughout the direct observation portion of the evaluation. Project staff and Ministry officials accompanied the team to the principal activities in each village, permitting additional impressions/insights to be gained while on site and from the beneficiaries.

The team spent one day on the site at San and a second day at Niono inspecting, discussing, and recording all project activities. Then the team returned to Bamako for more reading of reports, discussions and synthesizing impressions.

C. Synthesis and Write-up

Data impressions and recommendations were discussed at the site in San with the staff and team members participating. The same thing occurred at Niono. This time, the Africare Consultant marine biologist, Mr. Lamine Soumah, participated along with the Niono staff and evaluation team.

At a meeting in Bamako at the Eaux et Forêts office with the Director, Mr. Nampon Sonogo, the data collected, impressions, tentative conclusions and recommendations for the future were presented and discussed. Those present in addition to the Director were: Lamine Soumah, Marine Biologist; Qaadir Madyun, Africare Representative; Lamine Traoré, Ingénieur de Travaux; Hinna Haidara Chef de la Division Peche and Henry Van Blake.

Later Mr. Madyun and the team leader met with the Director of USAID/Mali, Mr. Wilson and discussed the project and the progress of the evaluation. Discussions were held with the Peace Corps Associate Director, Mr. Bertrum Laurent, near the beginning of the evaluation and after he had read the summary draft. Discussions were held with USAID personnel at the beginning, during the evaluation and after they had read the summary draft. These discussions included impressions and ideas concerning the future of the project.

The team leader returned to Washington, D.C., and there completed the final evaluation report and submitted it to Africare.

A copy is to be returned to Mali for review by the G.O.M., Peace Corps and USAID/Bamako.

IV. PRESENT STATUS OF THE PROJECT

A. San Station

1. End of project output: A pilot station at the village of San established and operating for fish breeding, fish production, fish hatching and the distribution of fingerlings. The station is to be composed of:

-ponds: 10 small (100 m²) size for breeding

4 holding tanks (.5m x 1m)

7 for production 500-1000 m²

all necessary canals and drainage to enable operation

-buildings: 2-room building for storage

2-room building for laboratory and office

-25 ha. of local villagers' fields in rice-fish culture.

2. Progress to date: The pilot station at the village of San has been established and is in operation.

3. Findings: The establishment and functioning of the pilot station was delayed by start-up problems. a) The original site was changed, requiring that the ponds be constructed on top of the ground instead of dug in the ground. The new site required that the land be cleared. b) Decision-making personnel in Operation Riz were changed and agreements could not be reached about the actuality of rice-fish culture and the supply of water in the canal for six months.

c) The construction technician employed by Africare terminated his services before construction was completed. The new technician discovered that sufficient clay had not been mixed with the soil and that there was not sufficient compaction. This required additional time and money to correct. d) A recommendation was made to change the site to Niono where water ran by gravity and was supplied in the canals, year round. This halted the construction of San until it was decided to complete the station at San and to purchase and install a private water pump. e) Two Peace Corps volunteers assigned to direct the extension condemned the project and left the country. f) Peace Corps/Mali did not supply replacements, thus effecting the extension work.

The station is composed of:

- Ponds: 9 breeding ponds
 - 5 of 1 Are volume
 - 1 of 4 Are volume
 - 1 of 5 Are volume
 - 1 of 6 Are volume
 - 1 of 7 1/2 Are volume = Total 27 1/2 Are(1)
- 4 holding tanks (5m x 1m)
- all necessary canals and drainage
- Buildings: 2-room structure for storage
- 2-room structure for laboratory and office

B. Training

1. End of project output: To train station and extension staff.

(1) 1 are = 100 m²

2. Progress to date: Several Malians have been trained to work at the station and in Extension.

3. Findings: There were four Malians who received training in either the Ivory Coast and/or Zaire. They did work at the station. However, as of now, there are only two at the station, with another presently at Bouaké Ivory Coast, being trained. One of the trained officers has been reassigned and the other one is undergoing Army Reserv training. It is expected he will return to the post upon completion of this training, making three at the station. This is sufficient manpower at present to operate the station.

C. Systems for the distribution of fish and the marketing of fish produced at the station

1. End of project outputs:

- a. A system established for the distribution of fingerlings and the marketing of fish produced at the station.
- b. The monies collected from the sale of the fingerlings and the fish produced applied to station cost.

2. Progress to date: An aerated tank has been constructed and is used for transporting fingerlings to the farmers at Niono. The tank is loaded on the back of a landrover pick-up truck which is assigned to the station for use by the Extension agents. Thus, the fingerlings can be transported wherever requested.

3. Findings: The holding pens at the station are functional, therefore, orders can be given, the staff at the station can sort the fingerlings and hold them in the pens ready for pick up or

delivery. This system was used once when fingerlings were requested and delivered to the Extension workers at Niono.

The first fish (approximately 1000) reached an average weight of 350 grams with a total weight of 275.39 kg. In order to convince doubting personnel that mature fish could be produced, a celebration was held and the fish were given away to these persons. The ministry has stated its next move will be to put most of the ponds into full fish production and the monies collected applied to the station costs.

D. Extension Work

1. End of project output: Systems established for extension work in support of fish production being undertaken by farmers.
2. Progress to date: The only Extension agent in the project is actively working with farmers in the Niono area with cage fish culture.
3. Findings: The two Peace Corps volunteers assigned to extension work resigned and were transferred out of the country. Africare employed a consultant marine biologist, who demonstrated successfully cage fish culture in canals at Niono. He taught the Eaux et Forets staff at Niono the technique of cage fish culture, including cage building, testing the water and feeding. Farmers did collect material, build a cage of their own, under Extension supervision, and are responsible for the daily feeding of the fish and care of the cages. There are sufficient

numbers of trained staff at Niono and the San Station to train enough Malians to expand the Extension effort.

E. Studies Made

1. End of project output: Study and recommend improved approaches for fish culture and production, and integration with other aspects of rural development.
2. Progress to date: No studies have been made.
3. Findings: The start-up problems delayed the progress of the station and extension work so that only one group of matured fish and fingerlings was produced. The level of training of the personnel at the station is not technically adequate to perform sophisticated studies, however, they are trained to do basic tests. The recording of these tests, plotting them over a year's time will be the benchmarks for improvement studies.

F. Self-sustaining of the station

1. End of Project output: Assess the self-sustaining potential of the fish station and Extension activities.
2. Progress to date: No efforts have been made to assess the self-sustaining potential of the station at San or the extension activities.
3. Findings: Using six ponds, the fish produced weighed 275.39 kg and the present market price for a 300g fish equals 100Fm. This gives a possible income of 91,797 Fm for six months' growth. Doubling the number of ponds and we have a possibility of 183,593 Fm. The tilapia fish from

the Boni River yielded 49.7 kg. This would produce an annual income of 33,133 Fm. There were 202,000 fingerlings collected but for which there was no charge. The 183,593 plus 33,133 Fm gives a beginning figure of 216,726 Fm to begin estimating the self-sustaining potential of the station.

(See Appendix 4)

G. Record Keeping

1. End of project output: Prepare report by end of year 1 and 2 on results obtained.
2. Progress to date: Records were kept of the number and weight of fingerlings received, their distribution, progress of growth, results of the first harvest. The manure applied was recorded. Also the feed was analyzed into composition, weight of proteins and protein percentage of feed. The chemical composition of the water from each pond, the canal, and from the river were recorded once. (See Appendix 2). Accounting records were kept of funds received and spent.
3. Findings: Chemicals were supplied the laboratory at San and two mobile testing kits delivered to the extension workers. This should ensure continuous testing of the water from the river, canals and the ponds. Also the canals at Niono are to be plotted over a year. The ministry intends to require that all records be contained and expanded.

V. SOCIOLOGICAL EFFECTS

A. Description

1. Women

Women constitute part of the target group for this project. Traditionally, the rural female groups have been neglected by agricultural extension services although these women have always played the major role in many rural communities with respect to agricultural production, marketing, and farm management.

The impact of a small-scale project such as this on the women of a country of some 5-6 million people must not be exaggerated. However, it is possible that on this small scale corrections of past inequities towards women can begin by extending to them fisheries extension services in the preservation and marketing of fish. Extension agents, for instance, should run experiments with the women on different methods of preservation in order to reduce the large loss of animal protein currently attributed to insect damage and spoilage. This pilot approach could help women become better preservers of fish and managers of its marketing.

This would not necessarily change the traditional role of women among the target population. In Africa, especially in rural areas, women have always preserved and marketed fish. This innovation would simply enhance the productivity of women in a traditional economic activity. Thus negative social consequences would not result from this approach.

2. Nutrition

Often, small-scale fishing and rice production in rural Africa are at subsistence levels. But production at this particular level leaves many members of an average rural family poorly fed, undernourished, and makes the management of large families very difficult. Experience shows that this is often the lot of many rural families that live by subsistence farming or fishing, a socioeconomic characteristic of this project's target area. Therefore, increases in productivity will enhance the capability of the local community to feed more people properly.

3. Health

Although this project is not on health per se, it is possible through more extension services (communication) with the poorest majority, that they would be able to experience better diets, better health and better child care. Of course, with increased productivity, enhancement of protein content, proper dieting, and related benefits, this would eventually reduce infant mortality due to protein deficient related diseases. Indeed, it could raise life expectancy.

4. Employment

Special interest groups whose monopoly of the current fishing industry of the area could oppose this innovation if only to protect their privileged positions. However, our investigation to date has not identified any particular group or groups that might stymie these efforts.

Provision of employment for persons involved is an added social impact. But such an impact would be much more significant in the long run with a large scale follow-up project than with the current scale of this operation. However, the potential exists. Gains from planning and management will certainly help similar communities empirically.

B. Progress to date

No progress has been made in potential sociological or economic change.

C. Findings

The project was functional for too short a time to make the sociological or economic changes anticipated. The time frame would require 3 to 5 years.

VI. ENVIRONMENTAL IMPACT

A. Description

1. Environment: Insofar as changing the environment is concerned, the place this project calls for the greatest activities is at the station itself where there are seven food and ten fingerling production ponds constructed. Impact rating negative.
2. Eliminating an element of the ecosystem:
Impact negative
3. Health Impact: The project in the fourth region of Mali is located along the banks of the Niger and Boni rivers. The rural populations use these water sources for all their

personal needs: drinking, cooking, washing, bathing, urinating and defecating. Consequently, water-related diseases are hyperendemic. Though there is no base line health data, it is estimated that some 80 to 90% of the people have malaria or schistosomiasis, either in clinical or sub-clinical form. In one sense, the project envisages a potential increase in human contact with water, through the fish ponds and canal system. The same contaminated river water for personal needs is pumped into the canals and ponds. Similarly, there is a potential increase in breeding sites for disease vectors.

However, to conclude that there is an adverse impact on human health is not justified. First of all, the project activities do not result in any significant change in either human contact with water or in breeding sites for disease vectors. The target group of beneficiaries are people already being fully exposed to contaminated water and disease vector breeding sites.

Secondly, although there is newly retained water in the fingerling and production ponds at the fish station, these ponds are periodically drained and cleaned as part of the fish program. In addition, employees at the station have been advised and educated regarding preventive health methods, and use of the latrines placed well away from all

contained water is required. Also, extension agents educate and advise farmers on how to break the schistosomiasis cycle.

Thirdly, a biological control of the schistosomiasis host snail is expected to be part of the work carried out at the station.

Furthermore, the added nutritional value of the fish produced should outweigh the small negative effect the newly retained water may have on the population. Therefore, assessing the above, the impact rating: none to low negative

4. International Impact: due to the small scale of this project no international impact is encountered.

Impact rating - none.

5. Controversial Impact: No controversial impact - rating None

6. Larger Program Impact: Fingerlings from this project can be used for other larger projects.

Impact rating- Negative

B. Progress to date - No environmental change

C. Findings - The station at San has been built, with ponds on top of the ground. At Niiono, Office du Niger will allow the use of their canals but forbids any alterations in them and none is necessary as the size of cages are adapted to fit the canals. The Office du Niger refuses to allow any fish ponds to be established on the area they control.

IMPACT FINDINGS

<u>Impact Areas and Sub-Areas</u>	<u>Impact Identification and Evaluation</u>
A. Land Use	
1. Changing the character of the land through:	
a. increasing the population	N
b. Extracting natural resources	N
c. Land Clearing	N
d. Changing soil character	N
2. Altering natural defenses	N
3. Foreclosing important use	N
4. Jeopardizing man or his works	N
5. Other factors	N
B. Water Quality	
1. Physical state of water	N
2. Chemical and biological states	N
3. Ecological balance	N
4. Other factors	N
C. Atmospheric	
1. Air additives	N
2. Air pollution	N
3. Noise pollution	N
4. Other factors	N
D. Natural Resources	
1. Diversion, altered use of water	N
2. Irreversible, inefficient commitments	N
3. Other factors	N

N = NO environmental impact

VII. Technology Applied

A. Description

A very simple and appropriate technology has been employed and should be applicable throughout all fish culture. Malians involved in every phase of the project should be able to duplicate the technology elsewhere in the country.

Since the training given Malians in Zaire and the Ivory Coast is of successful methods used in fisheries projects, there is no reason to believe those methods will fail when applied in Mali.

B. Progress to date

The station at San has been erected by building earthen ponds on top of the ground, building and grading canals to supply water and drainage when necessary. Simple monks and water gates were used. Simple cages were installed in the canals at Niono.

C. Findings

The ponds and canals could well be constructed by manual labor since the walls need be only 2 meters high. The cages at Niono were constructed of local material (bamboo, sticks, and bark).

The feed for the fish is in abundance in the area being composed of rice hulls, broken rice and fresh blood. Cattle and small ruminants are being slaughtered daily, and this blood is not normally utilized.

The containers to hold the feed are calabashes, which are available everywhere and can be grown by the farmers.

VIII. FINANCIAL ANALYSIS

A. Fisheries compared with Rice production

1. Cage Culture of Fish

1500 Fingerlings capacity in cage sized 3 x 1.5 x x lm

Cost of construction of cage

- 2 days labor with donkey 9,000 Fm

- 3 days labor to build cage 3,000 Fm

- 6 poles Bamboo at 1000 Fm each 6,000 Fm

Total Cost 18,000 Fm

1500 Fingerlings at 10 Fm(see Appendix 2) 15,000 Fm

Total known costs 33,000 Fm

Selling-

Each fish weighs 300g:

They sell for 500 Fm/kg (see Appendix 4)

1400 fish sold at 6 months weigh
420kg at 500 Fm/kg = 210,000 Fm

1400 fish sold at 6 months weigh
420kg at 500 Fm/kg 210,000 Fm

Gross Annual Income 420,000 Fm

Less total known costs 33,000 Fm

Estimated Annual Profit in Cagefish Production 387,000 Fm

2. Rice Production

One acre yields 3 to 4 tons

4 tons = 4,000kg

Rice sells for 250Fm/kg

4,000 x 250 = 1,000,000 Fm

Annual Income

1,000,000 Fm

Fertilizer

100,000 Fm

Insecticide

50,000 Fm

Water Rates

50,000 Fm

Cost of Production

200,000 Fm

Estimated Annual Profit in Rice Production

800,000 Fm

This indicates that with a very little additional input of money and labor, a rice farmer can make a sizeable increase in his income and his quality of life by using cage fish culture.

To try to bring the cost figures of pond fish culture into perspective we use the pond cost figures of the G.O.M. 22,500,000 Fm (see Appendix 3). Here they are planning to build 15 ponds, giving a cost figure of 1,500,000/pond. In the project progress report (Appendix 4), the gross income from ponds is calculated to be 139,695 Fm/harvest or 279,390 Fm/year. This appears to indicate that fish pond culture is out of the reach of the farmers.

This cannot be true since fish pond culture is on the increase in other third world countries, i.e., Zaire and Ivory Coast. There we expect the farmers are able to get ponds constructed or build them themselves for less than the G.O.M. cost. We anticipate the same would be true in Mali. Based on this, we expect that

pond cultivated fish would compete with cage grown fish for income. Surely rice-fish cultivation would compete since the cost of the pond would be divided between both rice and fish harvests.

B. Project Financial Status Report

The initial amount of the grant was \$294,000 and in 1981 an incremental funding of \$29,400 was granted, making the total \$323,400. The L.O.P. was increased by 10% because of delays and expenses encountered due to the physical relocation of the ponds, redrafting of construction plans and commodities were difficult to purchase in Mali.

As of 31 December, 1982, \$33,377 remained unspent. It is expected that most of this will be spent to install the new pump and pipes located at the San station.

FINANCIAL STATUS REPORT

(Follow instructions on the back)

1. FEDERAL AGENCY AND ORGANIZATIONAL ELEMENT TO WHICH REPORT IS SUBMITTED

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

2. FEDERAL GRANT OR OTHER IDENTIFYING NUMBER

688-0220

OMB Approved No. 80-RO180

PAGE OF
1 2

3. RECIPIENT ORGANIZATION (Name and complete address, including ZIP code)

AFRICARE
1601 Connecticut Ave., N.W.
Washington, D.C. 20009

4. EMPLOYER IDENTIFICATION NUMBER

23-7116952

5. RECIPIENT ACCOUNT NUMBER OR IDENTIFYING NUMBER

300 Mali Fisheries

6. FINAL REPORT

YES NO

7. BASIS

CASH AC

8. PROJECT/GRANT PERIOD (See instructions)

FROM (Month, day, year)

9/15/79

TO (Month, day, year)

3/31/83

9. PERIOD COVERED BY THIS REPORT

FROM (Month, day, year)

10/1/82

TO (Month, day, year)

12/31/82

10.

STATUS OF FUNDS

PROGRAMS/FUNCTIONS/ACTIVITIES ▶	(a) PERSONNEL	(b) TRAVEL & ALLOWANCES	(c) EQUIPMENT & SUPPLIES	(d) TRAINING	(e) CONSTRUCTION	(f) OTHER DIRECT	OVER TOTAL (g)
a. Net outlays previously reported	\$ 56,447.56	\$ 38,828.00	\$ 63,120.66	\$ 5,341.30	\$ 57,887.14	\$ 6,228.16	\$
b. Total outlays this report period	373.92	2,442.77	209.58	---0---	---0---	120.57	
c. Less: Program income credits	---0---	---0---	---0---	---0---	---0---	---0---	
d. Net outlays this report period (Line b minus line c)	373.92	2,442.77	209.58	---0---	---0---	120.57	
e. Net outlays to date (Line a plus line d)	56,821.48	41,270.77	63,330.24	5,341.30	57,887.14	6,348.73	
f. Less: Non-Federal share of outlays	---0---	---0---	---0---	---0---	---0---	---0---	
g. Total Federal share of outlays (Line e minus line f)	56,821.48	41,270.77	63,330.24	5,341.30	57,887.14	6,348.73	
h. Total unliquidated obligations	---0---	---0---	---0---	---0---	---0---	---0---	
i. Less: Non-Federal share of unliquidated obligations shown on line h	---0---	---0---	---0---	---0---	---0---	---0---	
j. Federal share of unliquidated obligations	---0---	---0---	---0---	---0---	---0---	---0---	
k. Total Federal share of outlays and unliquidated obligations	56,821.48	41,270.77	63,330.24	5,341.30	57,887.14	6,348.73	
l. Total cumulative amount of Federal funds authorized	66,947.00	34,568.00	55,974.00	6,543.00	58,820.00	32,800.00	
m. Unobligated balance of Federal funds	10,125.52	(6,702.77)	(7,356.24)	1,201.70	932.86	26,451.27	

11. INDIRECT EXPENSE

a. TYPE OF RATE

(Place "X" in appropriate box)

PROVISIONAL PREDETERMINED FINAL FIXED

b. RATE

SEE NEXT PAGE

c. BASE

SEE NEXT PAGE

d. TOTAL AMOUNT

e. FEDERAL SHARE

13. CERTIFICATION

I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

SEE NEXT PAGE

TYPED OR PRINTED NAME AND TITLE

DATE REPORT SUBMITTED

TELEPHONE (Area code number and extension)

-32-

FINANCIAL STATUS REPORT <i>(Follow instructions on the back)</i>				1. FEDERAL AGENCY AND ORGANIZATIONAL ELEMENT TO WHICH REPORT IS SUBMITTED		2. FEDERAL GRANT OR OTHER IDENTIFYING NUMBER		OMB Approved No. 80-RO180		PAGE OF			
AFRICARE 1601 Connecticut Ave., N.W. Washington, D.C. 20009				UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT		688-0220				2 2			
				3. RECIPIENT ORGANIZATION (Name and complete address, including ZIP code)		4. EMPLOYER IDENTIFICATION NUMBER		5. RECIPIENT ACCOUNT NUMBER OR IDENTIFYING NUMBER		6. FINAL REPORT		7. BASIS	
				23-7116952		3000 Mali Fisheries		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input type="checkbox"/> CASH <input checked="" type="checkbox"/> ACC			
				8. PROJECT/GRANT PERIOD (See instructions)				9. PERIOD COVERED BY THIS REPORT					
				FROM (Month, day, year)		TO (Month, day, year)		FROM (Month, day, year)		TO (Month, day, year)			
				9/15/79		3/31/83		10/1/82		12/31/82			
10. STATUS OF FUNDS													
PROGRAMS/FUNCTIONS/ACTIVITIES ▶		(a) INDIRECT COSTS	(b)	(c)	(d)	(e)	(f)	TOTAL (g)					
a. Net outlays previously reported		\$ 58,370.87	\$	\$	\$	\$	\$	\$ 286,223.69					
b. Total outlays this report period		652.47						3,799.31					
c. Less: Program income credits		---0---						---0---					
d. Net outlays this report period (Line b minus line c)		652.47						3,799.31					
e. Net outlays to date (Line a plus line d)		59,023.34						290,023.00					
f. Less: Non-Federal share of outlays		---0---						---0---					
g. Total Federal share of outlays (Line e minus line f)		59,023.34						290,023.00					
h. Total unliquidated obligations		---0---						---0---					
i. Less: Non-Federal share of unliquidated obligations shown on line h		---0---						---0---					
j. Federal share of unliquidated obligations		---0---						---0---					
k. Total Federal share of outlays and unliquidated obligations		59,023.34						290,023.00					
l. Total cumulative amount of Federal funds authorized		67,748.00						323,400.00					
m. Unobligated balance of Federal funds		8,724.66						31,377.00					
11. INDIRECT EXPENSE													
a. TYPE OF RATE (Place "X" in appropriate box) <input type="checkbox"/> PROVISIONAL <input type="checkbox"/> PREDETERMINED <input type="checkbox"/> FINAL <input type="checkbox"/> FIXED													
b. RATE 10.7%		c. BASE \$ 209.58		d. TOTAL AMOUNT \$ 22.43		e. FEDERAL SHARE \$652.47							
21.45%		2,937.26		630.04									
		\$3,146.84		\$652.47									
13. CERTIFICATION						SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL			DATE REPORT SUBMITTED				
I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.						<i>C. Payne Lucas</i>			4/13/83				
						TYPED OR PRINTED NAME AND TITLE			TELEPHONE (Area code, number and extension)				
						C. Payne Lucas			(202) 462-3614				
						EXECUTIVE DIRECTOR							

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IX. SUMMARY OF THE PROPOSED PROJECT

A Marine Biologist will execute the project assisted by a Malian counterpart. The Malian is to be trained in the U. S. and must return to the project while the Marine Biologist is in residence.

The central fisheries station at San will be expanded and utilized as a commercial fish production center, hatchery and an experiment station. The initial emphasis will be on commercial fish production but as the demand for fingerlings increases commercial fish production will decrease and the facilities will be used to meet the demand for fingerlings. Farmers will replace the lost commercial fish production. Monies collected from the sale of products at San will be returned to the project to perpetuate it.

Fish culture training of all Malians will be conducted at San and Niono. Farmers will be trained to use as many kilometers of the canals at Niono as possible for commercial fish production.

Credit will be extended to interested farmers and extension agents. The credit extended to farmers, whether groups or individuals, will enable them to build ponds. The extension agents will use the credit extended through the project to purchase molybdenum for transportation.

Studies will be made of market preferences, seasonal variations and conservation preferences. Water conditions will be studied wherever fish are produced. Diseases will be diagnosed and recorded using the Mopti and CVL laboratories when necessary.

Improved methods of conserving and packaging will be devised using the experiences obtained at Mopti by Operation Peche. These methods will be taught the women in the rural areas.

Peace Corps will direct the market studies, conservation of the fish and the construction of ponds.

Every effort will be made using extension agents to expand the commercial production of fish throughout Mali, using pond, cage and fish-rice culture.

TEAM MEMBERS

- | | |
|-------------------|---|
| Mr. Hinna Haidara | - Chef de la Division Peche et Pisciculture DNEF Bamako |
| Mr. Qaadir Madyun | - Africare Country Representative |
| Mr. Konaté | - Superieur Ingénieur des Travaux Forestiers |
| Mr. Lamine Traoré | - Ingénieur des Travaux Forestiers |

CONTACTS

- | | |
|---------------------|--|
| Ms. Theresa Ware | - Sociologist USAID/Bamako |
| Mr. Ralph Conley | - Chief Division Agriculture Projects
Head of Crops Division |
| Mr. Bert Laurent | - Associate Director, Peace Corps |
| Mr. Robert Wilson | - Regional Development Officer-
Francophone and West Africa,
Africare/Washington |
| Dr. Joseph Kennedy | - Director of International Development
Africare/Washington |
| Mr. Lamine Soumah | - Consultant Marine Biologist/Africare |
| Mr. Nampar Sanogo | - Director - Eaux et Forêt |
| Mr. David Wilson | - Director of USAID/Bamako |
| Mr. Moussa Niento | - Ingénieur des Travaux Forestiers |
| Mrs. Alameda Harper | - Regional Operations Officer
Africare/Washington |

Itinerary of Henry E. Van Blake
20 February to 6 March 1983

- 20 February, Sunday
Departed D.C. 4:45 pm
Travelling
- 21 February, Monday
Arrived Bamako 7:00 P.M.
Met Mr. Qadir Madyun, Africare Rep. at Bamako Airport
- 22 February, Tuesday
Messrs. Madyun and Van Blake visited USAID and conferred with Mr. Ralph Conley, Chief Division Agriculture Projects, Head of Crops Division about the evaluation of the project. At Eaux et Forets we met with Mr. Hinna Haidara and established a schedule for inspecting the site at San and at Niono. We presented the proposal to Ms. Therese Ware, Sociologist with USAID and asked for sociological input.
- 23 February, Wednesday
Due to mechanical problems we were late departing Bamako for San. Those on the trip were Messrs. Madyun, Haidara and Van Blake.
- 24 February, Thursday
We picked up the manager of the fisheries station, Adama Sabogo, and drove to the site. We inspected the ponds, laboratory, office, storage building and the pumps controlled by CMDT. We observed the site where the Eaux et Forêts pump will be installed. We agreed on the proper installation, i.e., it would be welded onto a raft, floated to the deepest part of the river and chained or cabled to the bank. The intake pipe should be suspended between two floating barrels so water will always be under it. At the San Laboratories we discussed the problems of the project, what had been accomplished and future usages. We met Mr. Lamine Soumah and planned the next day's schedule.
- Departed San 1:00 p.m.
Arrived Niono 8:00 p.m.

25 February, Friday
In Niono

Messrs. Soumah, Traoré and Konaté guided us to the village of Niono Koroni. Here we observed a 1 x 3.5 x 1m cage that had been stocked with fingerlings the day before. There were only four dead fish that had died due to the stress suffered while being transported. Later, we departed for Village Km26. Here we saw a cage 3 x 1.5 x 3m that also had been stocked the day before. Luckily, only one fish had died. We observed the feeding of the fish and where the feed was stored. Many villagers came out from the villages and we were able to interview them concerning their impression of cage culturing of fish. All were in favor of cage fish culture. Enroute to the village of Nique, we stopped and observed a site adjacent to the Lake (Falah) where it would be possible to build ponds, provided Office du Niger would allow. When we arrived at the village of Nique we were informed that all of the fingerlings had been stolen out of the cage 1 x 3.5 x 1m. After discussions, it was agreed to locate the cage close to the chief's house and restock it with fingerlings. The group returned to the Eaux et Forêts office in Niono and discussed the trip and the project, exchanging ideas and impressions.

Departed 3:00 p.m.

Arrived in Bamako 10:00pm

26 February, Saturday

Went into Africare office and started writing the evaluation.

27 February, Sunday

Spent the day composing and writing the evaluation.

28 February, Monday

Messrs. Madyun and Van Blake consulted with the Associate Director of the Peace Corps, Mr. Bert Laurent. He gave us a copy of the report produced by their last expert, Mr. Val Mezainis. We then met with the USAID Director, Mr. Wilson, and discussed the progress of the evaluation.

1 March, Tuesday

A meeting was held at Eaux et Forêts attended by: The Director, Mr. Nampan Sanogo, Mr. Hinna Haidara, Chef de la Division Peche, Mr. Lamine Traoré, Ingénieur des Travaux Forestiers, Mr. Qadir Madyun, Africare Representative, Mr. Lamine Soumah, Consultant and Mr. Henry E. Van Blake, Consultant. Here we presented

1 March (Continued)

recommendations for the continuation of the project. These, the director agreed to execute where possible. He revealed that Eaux et Forêts had written a proposal for the continuation of the project. See Annex 3. We returned to the office of Africare and together we worked on the evaluation. Messrs. Soumah, Madyun and Van Blake conferred with Mr. Ralph Conley, USAID, and he expressed a wish that a P.C. proposal be collaborated, funded and executed in Sikasso.

2 March, Wednesday

Mr. Van Blake remained in Bamako composing the summary and part of the proposal for the continuation of the project.

3 March, Thursday

Messrs. Madyun and Van Blake went to the office of Eaux et Forêts to continue our discussions on the new proposal, the project and the cost benefit figures. They agreed to supply Africare with the figures and their new proposal. Mr. Soumah joined us at the Africare Office and helped rewrite the summary. Mr. Rollo Erich, USAID Food and Ag Officer gave an appointment to discuss the summary and project on Saturday.

4 March, Friday

Completed summary of the team's findings and delivered copies to USAID, Peace Corps and Africare. Continued at the Africare Office writing on the evaluation report.

5 March, Saturday

Messrs. Madyun and Van Blake conferred with the Associate Director of the Peace Corps about the summary. We suggested that Peace Corps compose their opinions and forward them to the Africare Office in Washington, D. C. At USAID we had discussions with Messrs. Rollo Erich and Ralph Conley. USAID stated that the Peace Corps had made a request for fisheries financing that USAID could not legally finance. We informed them of Africare's intention to prepare a proposal for continuing the project and including the use of Peace Corps.

Departed Bamako 7:00 p.m

Arrived Washington, D.C. 9:30 A.M.

APPENDIX #1

INLAND FISHERIES FEASIBILITY SURVEY

REPUBLIC OF MALI

June 10 to July 12, 1978

Conducted By

Harry Rea

Dague Clark, APCD/Ag & RD

Bill Carberry, PCV

Mamadore Tourè

Introduction

Until recently it was believed that the Niger and Senegal river systems were capable of providing a virtually endless supply of fish to the people of Mali. However, over the past several years both the quantity and quality (size and preferred species) have declined due to the following reasons:

1. Over-exploitation, Traditional fishing methods are gradually being replaced by more modern techniques and equipment thus increasing the efficiency of the local fishermen. Fine mesh nets are being used to increase the catch, but these nets capture both young and mature fish thus reducing present and future brood stock.
2. Reduced reproduction. Along with the depletion of brood stock as mentioned above, the drought of the past few years has greatly reduced natural reproduction. Many species of riverine fishes breed during periods of flooding and much of the breeding takes place on the shallow flood plains.

Therefore, what exists is a system in which the outputs exceed the inputs leading to what may be the complete exhaustion of the fishery resources of these river systems.

Large quantities of the fish are dried or smoked. Considerable losses occur due to insect infestation. It has been estimated that these losses result in the processed fish having an animal protein content that is less than 15% of that in an equivalent quantity of fresh fish.¹

Of the estimated annual catch of 100,000 tons approximately 1/3 is exported and accounts for 15% of the commercial balance of the country.²

It is evident therefore that fish are important to Mali both economically and nutritionally, making it imperative that efforts be undertaken to increase fish production and to better utilize this important food source. It is on this basis that the National director of Eaux et Forêts expressed an interest in Peace Corps investigating the possibilities of starting a fish culture program. The areas of concern that he thought that Peace Corps should concentrate on are as follows:

1. Rice/fish culture
2. The use of rice fields to breed fish for restocking the rivers.
3. Investigation of lifecycles of important indigenous species in order to determine means of artificial propagation as well as to determine which species may be suitable for culture.

He also expressed the desire to see the results of a small program centered in the Central Delta region near Mopti. His choice of the Mopti area is based on the fact that this is the center of expertise due to the presence

¹

² Report of the Fisher Task Force. Club of the Friends of the Sahel. p. 43
IBID., p. 48

of Operation Netch (preservation, marketing, export) and the Hydrobiology Laboratory there.

"Also, approximately 90% of the total annual catch is produced in the Central Delta." ³

In addition several organizations (FAO/UNDP; FED; USAID) have interests in various fisheries projects in the area.

Unlike many of the African countries in which Peace Corps has successful on-going fish culture programs, Mali has no tradition of pond fish culture. In Cameroon and Zaire very basic types of fish culture were practiced even before the colonial period. The colonial powers later introduced more intensive fish culture but much of this was abandoned or neglected around the time of independence. So when Peace Corps began the fish culture programs in these countries the concept of pond fish culture was not unheard of. Peace Corps task consisted of renovating existing ponds, constructing new ponds, and intensifying management techniques in order to increase production and thus making it economically feasible for farmers to raise fish. In both cases volunteers work mainly with local farmers and use appropriate technology. At least initially the scope of a program in Mali may be somewhat different but the essential goals will be the same.

Governmental and Non-governmental Agencies Consulted

Ministry of Rural Development

Eaux et Forêts

Opération Pêche-Mopti

National Hydrobiology Laboratory, Mopti

Opération Riz-San

Opération Beguinéda

USAID

Africare

CARE

FAO/UNDP

FED

³

IBID., P. 48

SITE OBSERVATIONS

1. Mopti

A possible site for the construction at a fish station was recommended by the Director of Operation Pêche. This site is located near a recently installed pumping station. The station with a capacity of 250 m³/hr is meant to service the towns of Mopti and Séraré. The capacity could be increased only by the installation of additional pumping facilities. Also this area floods during rainy season so a large dike would have to be constructed. Because of these two considerations the investment needed to construct a station at this site would be very large. Considering the fact that this is really the only site available at Mopti, it was decided that another location for a station should be chosen.

The Hydrobiology lab is located in Mopti. The purpose of the lab is to collect specimens from the river in order to study the life cycles of the important commercial species in an attempt to find means of artificial propagation of these species for restocking the river. The lab is very poorly equipped. Presently there is a Peace Corps/Smithsonian volunteer working at the lab as part of his job.

At Operation Riz in Mopti considerable damage occurs to the rice crop due to fish that eat the rice plants or physically damage the plants. The volunteer mentioned above is working on a system of screens to keep fish from entering the rice fields. Because of this problem, Operation Riz has been very negative about the possibilities of rice/fish culture.

Because Mopti is located in a very flat flood plain, the construction of ponds, by local farmers would be quite limited and in most cases the land floods during rainy season. Probably the only extension work that could be done in the area would be with rice farmers who could raise fish in their rice fields. Some work could also be done with local fishermen.

2. Dogon Plateau

Water is very scarce in this region, making it impossible to grow fish in most areas. Many wells have been dug to supply villages with water. Also, several barrages have been constructed to collect and store rain water for use during the dry season. Most of these are completely drained each year in an effort to control schistosomiasis which is widespread in Mali. The soils below these barrages are usually too rocky to be suitable for pond construction. Also the formation of additional bodies of water may increase the already existing health problems.

These reservoirs could be stocked with fish and harvested when drained or throughout the year in those that cannot be drained. Snail eating fish could be stocked as a means of controlling schistosomiasis.* However, because the water in these reservoirs is used by several villages problems could occur at harvesting as to who gets how many fish. Also, because

* PCV Bill Carberry is looking into this possibility.

many of the reservoirs are completely drained each year, fish would need to be restocked yearly which would be a considerable input dollar wise for either the villages or GRM.

The following barrages were visited: Djoundjouron, Somoli, Sogodougou, Nombo, Da and Amani

3. Borko

This village is a virtual paradise. Located in a valley to the north of the Dogon Plateau, Borko and surrounding villages are supplied with water from 43 rainy season and 32 dry season springs. Because of the abundance of water, food is also plentiful. Many animals (goats, sheep, chickens, and cows) are raised making the need for fish somewhat questionable. Also there is a cultural belief that the fish present in the local streams are sacred and perhaps this would apply to fish raised in ponds even though the fingerlings stocked came from another place. The people however do eat the dried fish that come from Mopti. By far, this area has the greatest potential for the construction and management of small ponds by local farmers. However because the roads to Borko are extremely poor the village is very isolated making it unsuitable as a site for a station.

4. San

Opération Riz-San is under the direction of Opération Riz-Ségou. Near San there is a pumping station located on the Bani river with a capacity of 3500 liters/second and the facilities to increase by an additional 2000 liters/second. A system of canals here has been constructed to supply water to the rice fields. At present the water is not being fully utilized. Also there are considerable amounts of land that are not being cultivated and on which ponds could be easily constructed. Rice/fish culture is also very possible.

The Opération provides the water and extension services to local farmers who rent the rice fields. The rice that the farmers produce may then be marketed through the operation or by the farmers themselves. A similar procedure may be worked out for fish ponds.

Because of the year round supply of water and the availability of suitable land, San should be the location of a fish station that will produce food fish as well as fingerlings for stocking in other areas of Mali.

5. Koni

An Agricultural School is operated in Koni by the Catholic Mission there. Each year twenty to thirty five families come to stay at the mission and are trained in various methods of raising crops and livestock. After their stay at the center they return to their villages to implement what they have learned and to teach others. The Director of the center expressed an interest in fish culture in the program. There is a solar pump that is being used to irrigate crops but not to its full capacity. The center uses a diesel pump to pump from a year round source of water. Both of these sources could be used for fish culture. This Center would be an excellent means of bringing fish culture to local villagers.

6. Beguineda

A 27 kilometer long canal originating at the Niger River supplies water to Beguineda and surrounding areas. However this canal has been very poorly maintained over the years. Presently a 7 year project is underway to repair the canal. Because of this the canal must be left dry during certain parts of the year. In order to make sufficient water available for a station, a dam of cement and stone would need to be built across the main canal. This would make it possible to get water even during times when the rest of the canal was dry. The proposed site is about 5 kilometers from the mouth of the canal. The cost of constructing this dam would be quite high thus making the site economically unsuitable for a station. But small ponds could be built by farmers using the small irrigation canals which branch from the main canal. Water would only be available during certain parts of the year. In the future this could prove to be an excellent area for a fish culture extension volunteer to work in.

7. Fia

The director at the office at the Rehabilitation of the Blind in Bamako has expressed an interest in Peace Corps involvement in a model farm in Fia on which blind people will do the work. He would like to have PCVs working in agriculture projects and also fish culture. But there is no year round supply of water so fish culture could only be done during rainy season. A stream runs through the area and during the rainy season it floods out most of the area on which ponds could be constructed. However some fish culture could be done and the director's enthusiasm alone should warrant some involvement by Peace Corps.

--

RECOMMENDATIONS

1. A station should be constructed at San. The station would be used to produce both fingerlings and food fish. Food fish can be raised alone in ponds and also in combination with rice.

This station should consist of 10 small ponds (100 m²) for fingerling production and experimentation and initially 7 production ponds (500 m² to 1000 m²). Seven production ponds would make it possible for each pond to be harvested twice each year which means one pond to be harvested each month. At any one time six ponds would be in production and the seventh would be dried in order to eliminate any fish parasite or diseases that may be present and also to allow for any necessary maintenance. Also some rice fields should be constructed to allow for experimentation with rice/fish culture. A system of screens will be necessary to prevent wild fish from entering the ponds and rice fields. One volunteer will be necessary for this project.

2. The barrages on the Dogon Plateau should be stocked. But this program should be started on a small scale in order to find out what problems may arise. Along with this more work should be done to find a species of fish that can be used to control the schistosomiasis carrying snails. The PCV

presently in Mopti and his Malian counterpart--should undertake these two projects along with continuing his work at the Hydrobiology laboratory in Mopti.

3. Due to the scarcity of water in many parts of Mali, fish culture will be limited to areas near large rivers and especially the flooded rice perimeters. Therefore, a Peace Corps fish culture extension volunteer and his Malian counterpart will be working mainly with rice farmers who may be interested in rice/fish culture. But all other possibilities such as cage culture in rivers, and behind dams or in lakes should be considered. Other areas of the country may prove to be suitable for fish culture and the extension program should include these areas. Initially one PCV and a counterpart should be assigned to work with rice farmers in the San-Ségou-Mopti area. Part of their job will also be to determine the need for additional extension volunteers in the future.

4. Malian counterparts should be assigned to work with each of the PCVs. This is an extremely important aspect of Peace Corps involvement in a fish culture program in Mali as well as elsewhere. The training of Malians by PCV's will help to ensure the continuance of the program even after Peace Corps has ended its involvement. These counterparts should be assigned by the Eaux et Forêts, as agreed by the Directeur National d'Eaux et Forêts.

ANNEX B

INITIAL ENVIRONMENTAL EXAMINATION

PROJECT LOCATION: San, Mali
PROJECT TITLE: Mali Fish Production Station
FUNDING: AID OPG FOR \$250 Thousand
LIFE OF PROJECT (Funding): 2 years.
IEE prepared by: Dague B. Clark DATE: October 9, 1978

ENVIRONMENTAL ACTION RECOMMENDED

CONCURRENCE

DATE:

Ronald D. Levin

Country Development Officer

DECISION

APPROVED:

DATE:

APPROVED:

DATE:

I. EXAMINATION OF THE NATURE, SCOPE AND MAGNITUDE OF ENVIRONMENTAL IMPACTS

a. Project Description

The purpose of the project is to promote fish production in all regions of Mali without endangering existing fish reserves, in order to help increase the quantity and quality of protein available for local consumption and assist the rural people to add to their cash income.

The project and proposed plan of action has grown out of discussions and studies involving, in varying capacities, the government of Mali, the Peace Corps, USAID/Mali and Africare. The Mali National Director of Eaux et Forêts recognizes that intensive fish collection methods along major rivers are fast reducing existing reserves, and maintains that proper management of fish will remain important to Mali from both an economic and nutritional stand point.

Under the 4 year project, Africare and Peace Corps propose to work directly with Malian officials and technicians at the national, regional and local levels and with the village people at the village level to:

- a. Establish and operate a fish production station near the village of San for fish breeding, fish production and the hatching and distribution of fingerlings;
- b. Train station and extension staff;
- c. Distribute fingerlings to rice farmers;
- d. Assist farmers to undertake fish production in conjunction with existing paddy rice production;
- e. Study and recommend improved approaches for fish culture and production and integrated with other aspects of rural development;
- f. Assess the self-sustaining potential of the fish station and extension activities.
- g. Train a Malian Marine Biologist.
- h. Establish a credit organization to finance ponds and molyettes.
- i. Make marketing studies and analysis.
- j. Introduce improved methods of conserving fish.

The fish station will use the pumps which it will install located on the banks of the Bani river. Extension work will be done with the Bobo farmers at Opération Riz-San and others in all regions of Mali.

II. IDENTIFICATION AND EVALUATION OF ENVIRONMENTAL IMPACTS:

1. Changing the character of the land through:

- a. Increasing the population of people or animals:

Increased opportunities for work will only be in effect for the construction phase of the project. After the

first five months most of the work will be with farmers in the area already cultivating rice. The project is unlikely to accelerate population increase due to immigration. It may however, increase population density due to increased nutrition by the production of fish.
-Impact rating-none

- b. Extracting Natural Resources: the total project pumping requirement for the station is low. The maximum use will be about 10,000 m³/day or 0.125 m³/sec. This is insignificant in relation to the Bani river flow, and is highly unlikely to cause a perceptible downstream effect.
-Impact rating-none to low negative.
- c. Land Clearing : Construction will involve only a minimal excavation of soil at the site of the station. The existing vegetal cover consists of some seasonal grasses only. There are no bushes or trees to be removed. The surrounding land will be regraded and top-soil retained for placing back on top, with natural vegetation planted to maintain a natural cover.
-Impact rating-none.
- d. Changing the Soil Character:
- i. Texture: the land in the project area is flat and gently sloping. Except for the digging of the ponds and canals, no land grading is contemplated.
-Impact rating on texture-none
- ii. Structure: the soils at the station site are at present untilled, barren except for seasonal grasses, very low in organic matter and possessing minimal structure. The running of the station should do nothing to change this except add some organic matter to the soil. The same is true for the farmer's rice paddies.
-Impact on structure-none to low positive.
- iii. Nutrient status: initial nutrient availability has been sufficient for a satisfactory rice crop. The addition of fish will subtly increase organic matter
-Impact on nutrient status-none to low positive.
- iv. Aeration and water infiltration: it is highly unlikely to have effect on aeration and water infiltration.
-Impact rating-none.
- v. Drainage and salinity: The slope of the land and impermeability of the soil in the area may cause drainage problems from the discharges of the production

ponds. Since the project is set up to drain TWD a month this should not create significant drainage problems.

Considering the sum of these factors, the overall impact on soil character is expected to be none to low negative.

2. Altering natural defenses: impact rating none.
3. Foreclosing important use: the land at the station site is being used at this time. Extension work will be done with farmers in the other regions already cultivating rice. Rice/fish polyculture, if it has an effect on rice production, should be positive. The reservoirs in the other regions are used for irrigation purposes and the project should not interfere in any way with this activity.
-Impact rating none to low positive.
4. Jeopardizing Man or his works: Impact rating none.

Water Quality

1. Physical state of water: small demand of irrigated water on gentle slopes (1-2%) will not cause any increased sediment load. The water flowing in the ditches from the pumps presently installed is clear to semi-turbid.
-Impact rating none.
2. Chemical and biological status of water: no pesticides or chemical fertilizers will be financed or promoted under the project.
-Impact rating none.
3. Ecological balance: indigenous species of fish to the Niger and Bani river systems will be used for the project. The production ponds and rice paddies will be completely drained and dried in an effort to eliminate any fish parasites or diseases that may be present. Only after many tests on the effect on the ecosystem will a species of fish or other biological methods be introduced for control of the schistosomiasis carrying snails in the reservoirs in the other regions of Mali.
-Impact rating none.

C. Atmospheric

1. Air additives: no use of sprayed pesticides or herbicides is contemplated in this project.
-Impact rating none
2. Air pollution: the amount of exhaust gases generated by the pumps will be insignificant.
-Impact rating none

3. Noise pollution: the pump used is located on the Bani river bank some 15 Kilometers from San. Therefore, they are inaudible in the village.
- Impact rating - none

D. Natural Resources

1. Diversion or increased use of water: The effect of the increased use of water at the fish station will be minimal.
-Impact rating-none
2. Irreversible, inefficient commitments: No alternative development use is foreseen for the area.
-Impact rating-none.

E. Cultural

1. Altering physical symbols: No impact
2. Dilution of cultural traditions: The project is introducing a new crop, fish, to be cultivated in conjunction with rice by traditional rice farmers. It is hard to say what effect this will have on the cultural traditions at this time.
-Impact none to low positive.

F. Socio-Economic

1. Changes in economic/employment patterns: The project should have an effect on the levels of income in the target group by the sale of fish.
-Impact rating-moderate, positive.

2. Change in Population: See A.1.a.

3. Changes in cultural patterns:

The project could increase the income of women, since they are traditionally involved in the preservation and marketing of fish. The project plans to enhance the productivity of women in a traditional economic activity by having extension agents will work with the women on different methods of preservation in an effort to reduce the large loss of animal protein currently attributed to insect damage and spoilage.

-Impact rating-none to low positive.

G. Health

1. Changing the Environment: In so far as changing the environment is concerned the only place this project calls for activities is at the station itself where there will be 19 food and fingerling production ponds constructed.
- Impact rating - none
2. Eliminating an element of the ecosystem:

See B.3.
- Impact none to low positive.
3. Other factors: The proposed project in the fourth region of Mali is located along the banks of the Niger and Bani rivers, and other areas of Mali. The rural populations use these water sources for all their personal needs: drinking, cooking, washing, bathing, urinating and defecating. Consequently, water-related disease are hyperendemic. Though there is no base line health data, it is estimated that some 80 to 90% of the people have malaria or schistosomiasis, either in clinical or sub-clinical form. In one sense, the project envisages a potential increase in human contact with water, through the fish ponds and canal system. The same contaminated river water for personal needs will be pumped into the canals and ponds. Similarly, there is a potential increase in breeding sites for disease vectors.

However, to conclude that there will be an adverse impact on human health is not justified.

First of all, the project activities will not result in any significant change in either human contact with water or in breeding sites for disease vectors. The target group of beneficiaries are people already being fully exposed to contaminated water and disease vector breeding sites.

Secondly, although there will be newly retained water in the fingerling and production ponds at the fish station, these ponds will be periodically drained and cleaned as part of the fish program. In addition employees at the station will be advised and educated regarding preventive health methods, and use of the latrines placed well away from all contained water will be required. Also, extension agents will educate and advise farmers on how to break the schistosomiasis cycle.

Thirdly, a biological control of the schistosomiasis host snail will be part of the work carried out at the station.

Furthermore, the added nutritional value of the fish produced should outweigh the small negative effect the newly retained water may have on the population. Therefore, assessing the above, the impact rating: none to low positive.

H. General

1. International impacts: due to the small scale of this project no international impacts are foreseen.
-Impact rating-none.
2. Controversial impacts: no controversial impacts-rating none.
3. Larger program impacts: fingerlings from this project can be used for other larger projects.
-Impact rating-moderate positive.
4. Other factors: no other factors are foreseen at this time.
-Impact rating-none.

- I. Other possible Impacts (not listed above).
-Impact rating-none.

III. Recommendation for Environmental Action

The preceding discussion has indicated that the effects of the project on the natural environment are expected to be small and, on the balance, positive. No potential negative effects are foreseen which would not be reversible.

Furthermore, an Environmental Assessment or an Environmental Impact Statement at this stage is unlikely to shed much additional light on the situation, since the project activities are essentially new and at present no data exists to study their possible effects on the environment. There will be an evaluation done after year year of the project. These will include any possible negative effects on the environment.

Consequently, a negative determination is recommended, together with a monitoring of environmental effects throughout project life by the station and extension staff for early identification and correction of any possible negative effects.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-Areas

Impact Identification and Evaluation

<p>A. Land Use</p> <p>1. Changing the character of the land through:</p> <p> a. Increasing the population</p> <p> b. Extracting natural resources</p> <p> c. Land Clearing</p> <p> d. Changing soil character</p> <p>2. Altering natural defenses</p> <p>3. Foreclosing important use</p> <p>4. Jeopardizing man or his works</p> <p>5. Other factors</p>	<p align="center">N</p> <p align="center">N to L</p> <p align="center">N</p> <p align="center">N to L</p> <p align="center">N</p> <p align="center">N to L</p> <p align="center">N</p> <p align="center">N</p>	<p>negative</p> <p>negative</p> <p>positive</p>
<p>B. Water Quality</p> <p>1. Physical state of water</p> <p>2. Chemical and biological states</p> <p>3. Ecological balance</p> <p>4. Other factors</p>	<p align="center">N</p> <p align="center">N</p> <p align="center">N</p> <p align="center">N</p>	
<p>C. Atmospheric</p> <p>1. Air additives</p> <p>2. Air pollution</p> <p>3. Noise pollution</p> <p>4. Other factors</p>	<p align="center">N</p> <p align="center">N</p> <p align="center">N</p> <p align="center">N</p>	
<p>D. Natural Resources</p> <p>1. Diversion, altered use of water</p> <p>2. Irrversible, inefficient commitments</p> <p>3. Other factors</p>	<p align="center">N</p> <p align="center">N</p> <p align="center">N</p>	

-
- N NO environmental impact
 - L Little environmental impact
 - M Moderate environmental impact
 - H High environmental impact
 - U Unknown environmental impact

E.	Cultural	
	1. Altering physical symbols	
	2. Dilution of cultural traditions	$\frac{N}{N \text{ to } L}$ positive
	3. Other factors	$\frac{N}{N}$
F.	Socioeconomic	
	1. Changes in economic/employment patterns	$\frac{M}{N}$ positive
	2. Changes in population	$\frac{N}{N \text{ to } L}$ positive
	3. Changes in cultural patterns	$\frac{N}{N}$
	4. Other factors	
G.	Health	
	1. Changing a natural environment	$\frac{N}{N \text{ to } L}$ positive
	2. Eliminating an ecosystem element	$\frac{N}{N \text{ to } L}$ positive
	3. Other factors	
H.	General	
	1. International impacts	$\frac{N}{N}$
	2. Controversial impacts	$\frac{N}{N}$
	3. Larger program impacts	$\frac{M}{N}$ positive
	4. Other factors	$\frac{N}{N}$
I.	Other possible impacts (not listed above)	$\frac{N}{N}$

ANNEX C

Government of Mali Contributions

Budget Summary

	<u>Year 1</u>	<u>Year 2</u>	<u>Total</u>
A. <u>Personnel</u>			
Fish Station Manager	1,300	1,560	2,860
Extension Agent	<u>600</u>	<u>2,840</u>	<u>3,440</u>
Subtotals	1,900	4,400	6,300
B. <u>Training</u>			
Subtotal	-0-	1,000	1,000
C. <u>Commodities</u>			
Subtotal	-0-	-0-	-0-
D. <u>Other</u>			
Value of 2 hectar of land	1,780	0	1,780
Insurance and tax on Vehicles	<u>360</u>	<u>760</u>	<u>1,120</u>
Subtotal	2,140	760	2,900
TOTALS	4,040	6,160	10,200

Peace Corps Contributions

Budget Summary

A. <u>Personnel</u>			
Cost of PCVs	20,000	50,000	70,000
Subtotal	20,000	50,000	70,000
B. <u>Training</u>			
Language training a \$500/week	<u>4,000</u>	4,000	8,000
Subtotal	4,000	4,000	8,000
C. <u>Commodities</u>	-0	-0	-0-
D. <u>Other</u>	-0	-0	-0-
TOTALS	24,000	54,000	78,000

Justification for Waivers1. Requirement that highway vehicles be of U.S. origin:

Essential to undertaking of this project will be a waiver of the requirement that all highway vehicles be of U.S. origin basically because the four toyotas and ten motorcycles will be needed from the onset of the project and the time lapse of shipping the vehicles would delay the start of the project by several months. In addition there are no spare parts for U.S. origin highway vehicles available in Mali. Hence this could cause critical delays in the project when vehicles are needed but could not be used because of a replacement part. Therefore, a waiver is required to procure the non U.S. vehicles necessary for the project in neighboring Upper Volta.

2. Allowance of procurement of brand-name materials:

A waiver is required to procure brand name vehicles for the project namely Toyotas and Suzuki motorcycles involved. The reason for the waiver is replacement parts are available in Mali and neighboring countries for these vehicles thus reducing any delay due to a mechanical breakdown.

3. Restriction on the 10% portion of local currency to be used to procure in Mali shelf item commodities from developed countries other than the United States:

This is based on the fact that the required items will almost entirely involve construction, commodities needed early in Year 1 and fuel throughout the project, and given the fact that these items are not available in Mali of U.S. or LDC origin, it will be essential to this project that the 10% restriction on shelf items of such nature be raised to 15%.

ANNEX E

IMPLEMENTATION SCHEDULE

PILOT FISH PRODUCTION PROJECT

SAN, MALI

NOTE: The lines and arrows opposite each entry show the plan of implementation as of October, 1978. The space below the dotted line is provided for subsequent adjustments and revisions of time schedules.

Paint & Brushes

5 gal. white non toxic enamel
18 gal. white wall paint
1 gal. metal enamel
1 gal. silicon sealent
2 gal. paint thinner
4 paint rollers
2 1 1/2" paint brushes
4 4' paint brushes

Equipment

10 locks
10 5 liter buckets
6 20 liter plastic tubs
3 drain plugs
1 air compressor
1 generator (1 watt)
34 m² 6 mm mesh screen
30 m² fine mesh screen
1500 20 cm x 3 cm wood screws
5 kg. nails
10 10 m x 1.5 m nets
2 desks
4 chairs
1 typewriter
1 blackboard
paper, books, record books
misc. office materials
1 4-drawer file cabinet
1 money box
1 metal closet with 4 shelves

ANNEX F

Locally procured Construction Materials

20	shovels
20	picks
10	wheelbarrows
5	hammers
5	planes
5	screwdrivers
5	chisels
5	pliers
5	punches
5	saws
5	levels
10	trowel (5 bricklayer's, 5 plasterer's)
4	24" pipe wrench
1	pipe cutter
1	pipe threader
2	plumb bobs
500	50kg. sacks cement
100	6 m x 6 mm reinforcement rods
4	metal doors 1 m x 2.2 meters
10	windows 1 m x 1.5 meters
12	I-Beams 6 m x 10 m
42	6 meter x 1 meter indulated tin
300	fasteners for indulated tin
2	metal sinks
	tile for counter top
6	cabinets 1 meter x .5 meter

Wood (white wood)

12	2.5 cm x 30 cm x 6 m
3	4 cm x 30 cm x 6 m

Plywood

5	pieces 244 cm x 122 cm x 10 mm
3	cans of glue

PVC pipe

25	110 mm x 6 m
4	elbows 110 mm diam.
2	cans glue

Steel pipe

60m	26/34 galvanized pipe
4	26/34 faucets
60m	15/21 galvanized pipe
1	can sealent

ANNEX C

Building Discription

The fish station at San will call for banco block buildings with galvanized steel roofs. The first will house the laboratory and office space and be 10 meters in length and 5 meters in width, and will be divided into two rooms. One of these will contain the laboratory equipment and will be 6 meters long. The other will be 4 meters in length and will be used for office space. Each of these rooms will have one locking steel louvered door, 2.2 meters in height by 1 meter in width, and three locking steel louvered windows, 1.5 meters high and 1 meter wide.

The second building will be used as a storeroom for fuel and equipment. It will be 10 meters in length by 10 meters in width and will also be divided into two rooms. One of these will be 7 meters in length and the other will be 3 meters in length. Each of these rooms will have one locking steel louvered door (2.2 meters in height by 1 meter in width) and two locking steel louvered windows (1.5 meters in height by 1 meter in width).

APPENDIX #2

Production Capacity of San Station After Extension by

Mr. Hinna Haidara
Chef de la Division Pêche
et Pisciculture

Sale of Fish

- Surface area of ponds 72.5 ares
60 ares for production purposes
12.5 ares for research
- Type of fish to be raised: Tilapia Nilotica
average weight (6 months) - 250 grams
- Sale price for fish at San - 500 MF/kg
- Number of young fish $60 \times 200 = 12,000$ fish (2 frv/m²)
- Loss (natural deaths) = 5%
or $12,000 - 600 = 11,400$ fish
- Total harvest weight
 $250 \text{ gms} \times 11,400 = 2850 \text{ kgs.}$
- Sale price
 $2850 \times 500 \text{ F} = 1,425,000 \text{ mf (at San)}$
- Annual receipt
 $1,425,000 \text{ mf} \times 2 = 2,850,000 \text{ mf}$

Sale of Fingerlings

- After six months the small fish start to become available. It is estimated that an average of 5 cages or extension ponds, could be constructed per month, with an average capacity of 300 fingerlings per cage of 50 gms; or $300 \times 5 = 1500$ fry per month or 9000 semi-annually.
- Total weight = $50 \text{ gms} \times 9000 \text{ fish} = 450,000 \text{ gms.}$
- Transference price per kg to the farmers - 200F
- Cost of transference of 9000
 $200 \text{ MF} \times 450 \text{ kg} = 90,000 \text{ MF}$
1 fingerling = 10 Fm

This amount can be expected to multiply by five or even ten depending on the extent of popularization.

1°/- PRESENTATION DU PROJET PISCICULTURE EN ETANGS DE SAN
(PHASE II)

17/1/83 3

Rappel des objectifs de la phase 1 : Les objectifs du projet pisciculture en étangs de SAN étaient les suivants :

- Produire du poisson de taille marchande dont la commercialisation sur le marché local permettrait d'amortir certaines charges du projet.
- Produire des alevins en vue de la vulgarisation de la technique auprès des paysans intéressés.
- Entreprendre une recherche appliquée sur la biologie des espèces locales en vue de leur introduction éventuelle en pisciculture.

Le projet comporte une station à SAN et une antenne de vulgarisation à Niéno (Office du Niger).

La station de SAN située à 1,800 km du fleuve BANI à proximité de la tête morte du canal principal d'irrigation de CMDT (précédemment Opération Riz) comprend :

Une série de 9 étangs totalisant 27,5 ares soit 2750 m² (la moitié de la superficie initialement prévue).

- des bassins de stockage des alevins
- Un bloc laboratoire-bureau
- Un magasin de stockage
- Une moto-pompe avec une tuyauterie d'alimentation sur 1 800 m
- Un hangar de stockage
- Une clôture

Le projet est rentré dans sa phase active à partir de Décembre 1981 et se charge des étangs à l'aide d'alevins de *Tilapia nilotica* en provenance de Bouaké.

Il faut préciser qu'à côté de ces alevins importés nous avons procédé à l'expérimentation d'espèces locales notamment : le *Tilapia* et le *Garias* du BANI.

2°/- JUSTIFICATION DU PROJET :

La baisse inquiétante de la production piscicole fluviale, l'inégale répartition de cette production à l'échelle du territoire national, les résultats appréciables enregistrés au cours de la phase expérimentale du projet viennent confirmer notre conviction que seul un développement harmonieux de la pisciculture permettra aux maliens de bénéficier du maximum de protéines animales d'origine piscicole, en même temps d'atténuer la pression assez forte des populations sur les plans d'eau déjà bien éprouvés.

L'expérience de SAN nous paraît un acquis de taille qu'il faille consolider et étendre à d'autres zones - tel est le but principal de cette phase II-

P R E A M B U L E

Le projet pisciculture de SAN fruit de la Coopération entre le Gouvernement du Mali et Africare au terme de la convention signée le 14 Novembre 1979 a pris théoriquement fin le 14 Septembre 1982. En vue d'utiliser le reliquat des fonds la durée du projet a été prorogée de 6 mois.

Cependant compte tenu des résultats enregistrés au cours de cette phase expérimentale et des potentialités qu'offrent les périmètres irrigués de l'office du Niger et de la CNDT, il nous a paru indispensable d'entreprendre une seconde phase qui consistera essentiellement en la consolidation des acquis et en l'extension de la technique de pisciculture à d'autres zones du pays.

3°/- Objectifs du Projet :

Le présent projet reprend à son compte les objectifs du projet initial en tenant compte des insuffisances enregistrées dans son exécution - Ce sont :

- la production en étangs de poisson d'embouche
- la production d'alevins en vue de la vulgarisation auprès des paysans de la technique de pisciculture
- l'empoissonnement des cours d'eau, et de petites retenues d'eau
- la recherche sur la biologie des espèces locales en vue de leur introduction en pisciculture.

4°/- PROGRAMME :

Le programme prévoit :

• à S A N

• La construction de neuf étangs nouveaux

• l'équipement du laboratoire de contrôle et la mise en œuvre du programme de recherche.

- la fourniture d'eau et d'électricité aux bâtiments (laboratoire notamment) par la réalisation d'un forage avec pompe immergée et l'installation d'un groupe électrogène.

- l'acquisition de moyens logistiques divers (véhicule tout terrain motos).

• à N I O N O

- la construction d'une série de 6 étangs (alevinage)

- la construction d'un magasin - bureau

- l'acquisition d'un groupe moto-pompe

- l'acquisition de moyens logistiques (véhicule tout terrain, motos).

La mise en œuvre du programme de vulgarisation par la construction d'étangs de démonstration et l'encadrement des colons en rapport avec l'Office de Niger.

A cet effet les expériences actuellement mises en œuvre nous permettront de définir le type de pisciculture le mieux adapté par conséquent le plus vulgarisable (enclos, cages, étangs...etc).

Il nous a paru indispensable de donner une certaine autonomie à NIONO compte tenu de la distance qui le sépare de SAN et des perspectives assez prometteuses de la pisciculture dans cette zone.

Il n'en demeure pas moins qu'avant la réalisation de la station de NIONO, les étangs de vulgarisation seront desservis par SAN qui dispose déjà d'un stock d'alevins assez important.

A MOPTI -

Il s'agira essentiellement d'aider à la mise en oeuvre d'un programme déjà entamé par le laboratoire d'hydrobiologie de Mopti. Il s'agit de l'empoissonnement des petits barrages du pays Dogon.

En effet ces petits barrages initialement créés pour développer les cultures maraichères se sont avérés des lieux de prédilection pour le vecteur de la bilharziose et cela à cause de l'abondance des mollusques (les escargots notamment). On a donc pensé à élever dans ces retenues une espèce de poisson prédateur des escargots (Clarias). Ce qui aura l'avantage à la fois de lutter contre la maladie et de fournir à la population ^{de la protéine animale} dans une zone où le poisson est un luxe (la consommation moyenne l'une des plus faibles du territoire est de l'ordre de 5Kg/Habitant/an).

Il s'agira au niveau de SAN de pouvoir réunir toutes les informations biologiques quant à l'élevage de l'espèce en question (alimentation, reproduction, croissance, moeurs etc...).

D'autre part le projet devra venir en aide au laboratoire de Mopti sous forme d'intéressement du personnel d'encadrement de cette antenne (primes de rendement).

A SIKASSO

Il s'agira essentiellement de la mise en oeuvre d'un programme de vulgarisation en zone CMDT. Les étangs de vulgarisation de Sikasso seront empoisonnés à partir de SAN. Des moyens logistiques (Motos) devraient être prévus pour les encadreurs.

a/ Le choix des espèces :

Comme dans la première phase du projet l'espèce à élever sera le Tilapia nilotica couramment appelé carpe compte tenu des performances déjà enregistrées. C'est également cette espèce qui fera l'objet de vulgarisation à MIONO à SIKASSO.

Par contre au pays Dogon il s'agira plutôt ^{du} Clarias (Silure) compte tenu de son régime alimentaire et de ses facultés à survivre dans des conditions physicochimiques difficiles.

Cette espèce sera donc l'objet d'une recherche appliquée à la station de SAN notamment en ce qui concerne sa reproduction en étangs.

D'autres espèces locales, le Tilapia du Bani notamment qui a manifesté de très bonnes performances en phase 1 - du projet seront également expérimentées. A noter qu'à propos du Tilapia du Bani le seul handicap enregistré était la non-résistance à la manipulation.

b/ La nourriture des poissons

Elle sera fournie par les différentes unités agro-industrielles locales (Rizerie, Uaine d'égrenage etc...). Nous estimons, compte tenu de la dimension actuelle de nos étangs et du système de vulgarisation qui fera appel à l'alimentation naturelle que le problème de nourriture ne se posera pas à moyen terme.

A Mopti cette nourriture sera exclusivement naturelle.

4°/- IMPLANTATION :

Elle se fera en repport avec les structures d'encadrement déjà existantes (CMDT) à SAN et à SIKASSO, Office de Niger à Niono, laboratoire d'hydrobiologie à Mopti etc...).

Il n'en demeure pasmoins que les agents des Eaux et Forêts (cadres et animateurs) et les volontaires du corps de la Paix ont un rôle prépondérant.

Les volontaires du corps de la Paix seront homologués à des agents des Eaux et Forêts qu'ils auront la charge de former en matière de pisciculture.

5°/- CADRE INSTITUTIONNEL :

Le projet sera mis en œuvre par le Ministère chargé du Développement Rural pour le compte du Gouvernement du Mali. Il sera exécuté par la Direction Nationale des Eaux et Forêts. Le projet sera supervisé par la Division Pêche et Pisciculture de la DNEF avec deux chefs de Station : SAN et NIONO. Les agents d'encadrement seront des préposés des Eaux et Forêts qui seront homologués aux volontaires du corps de la Paix. Le corps de la Paix fournira des volontaires spécialisés ayant une très grande expérience en matière de pisciculture.

6°/- PERSONNEL :

- Le personnel pourra ainsi se composer de la façon suivante :

BAMAKO :

Chef du Projet : Chef de la Division Pêche et Pisciculture

S A N

- 1 Chef de Station
- 1 agent chargé de la vulgarisation
- 1 agent chargé du laboratoire
- 1 moniteur Assistant

NIONO :

- 1 Chef de Station
- 1 Agent chargé de la vulgarisation
- 1 Moniteur assistant
- 3 Moniteurs de vulgarisation

SIKASSO :

- 2 Moniteurs de vulgarisation

MOPTI :

- 2 Moniteurs de vulgarisation

Dans les zones où les structures d'encadrement existantes sont disposées à fournir des moniteurs il sera pas nécessaire de faire venir des agents des Eaux et Forêts.

7°/ PERSPECTIVES

La pisciculture reste un grand espoir dans la perspectives d'autosuffisance alimentaire de notre pays. En effet partout où il y a de l'eau la pisciculture est susceptible d'être pratiquée. Aussi le jour où les populations comprendront que la production de poisson n'est pas exclusivement liée aux grands fleuves, le jour où les innombrables rivières, marigot, mares, lacs et canaux d'irrigation pourront être empoisonnés, alors la carence protéinique sera vaincue et la pisciculture aura atteint son but.

PROJET PISCICULTURE EN ETANGS DE SAN PHASE -II-

BUDGET PREVISIONNEL

POSTES DE DEPENSE	ANNEE 1	ANNEE 2	ANNEE 3	TOTAL
<u>PERSONNEL</u>				
Salaires Ouvriers journaliers et Permanents	9 500 000	5 500 000	2 500 000	17 500 000
Primes de rendement	2 280 000	2 280 000	2 280 000	6 840 000
Formation	3 000 000	1 500 000	-	4 500 000
Voyages	1 500 000	1 500 000	1 500 000	4 500 000
<u>INVESTISSEMENTS</u>				
Construction d'étangs cloiturés	122 500 000	-	-	122 500 000
Construction de Bâtiments	9 500 000	4 500 000	-	14 000 000
Forage + Equipements	12 500 000	-	-	12 500 000
<u>EQUIPEMENT</u>				
Véhicules (2)	14 000 000	-	-	14 000 000
Motos (10)	4 000 000	4 000 000	-	8 000 000
Moto-pompe (1)	6 000 000	-	-	6 000 000
Equipements labo	7 500 000	-	-	7 500 000
Outils Divers	5 500 000	3 500 000	1 500 000	10 500 000
Location + Transport	5 500 000	3 000 000	2 500 000	11 000 000
<u>FONCTIONNEMENT</u>				
Carburant + Lubrifiant + Rep	5 500 000	6 000 000	7 500 000	19 000 000
Matériel de bureau	3 500 000	3 500 000	3 500 000	10 500 000
Fonds de Recherche	2 500 000	2 500 000	2 500 000	7 500 000
Divers	3 500 000	1 200 000	1 000 000	5 700 000
<u>AUTRES EMPLOIS FINANCIERS</u>				
Inflation	8 852 000	8 852 000	8 852 000	26 556 000
Imprevus	3 000 000	3 000 000	3 000 000	9 000 000
	30 132 000	50 832 000	36 632 000	217 596 000

N.B. Ce budget étant purement indicatif, toute latitude sera laissée au projet

A N N E X E

Il faut entendre par ouvriers journaliers : les manoeuvres qui sont recrutés selon les besoins pour exécuter des travaux temporaires (construction d'étangs d'étangs, entretien périodique, etc...). Ils seront payés en fonction du taux journalier en vigueur dans la localité où ils sont utilisés. Quant aux Ouvriers permanents, ce sont : les gardiens, chauffeurs et manoeuvres qui sont recrutés pour la durée du projet sauf en cas de défaillance. Ils seront payés sur la base de la réglementation en vigueur.

- Primes de rendement : Il s'agira d'une prime forfaitaire dont le taux sera arrêté en fonction des bénéficiaires et qui ne sera octroyée que si l'agent accompli effectivement le travail pour lequel il a été désigné.

- Voyages - Formation : Il s'agira des voyages que les agents du projet doivent effectuer pour bénéficier des expériences d'autres pays. Il nous paraît constamment indispensables que les cadres du projets puissent visiter le complexe piscicole d'Aléka (Bouaké, République de Côte d'Ivoire) très avancé dans l'élevage du Tilapia de même que le Centre de Pisciculture de Landja près de Bangui en République Centrafricaine.

Les voyages pourront également avoir d'autres buts tel que l'achat d'équipement de laboratoire notamment :

- Location - Transport : Il s'agit de la location de matériel lourd (pelle, bulldozer, camions etc...), pour la construction des étangs notamment ainsi que le transport de différents matériels entre les différents sites.

- Fonds de recherche : Il s'agit d'un fonds qui sera exclusivement réservé à la recherche d'accompagnement.

- La contre-partie malienne consiste essentiellement au paiement des salaires des fonctionnaires de l'Etat.

N° de référence | Désignation du projet : Projet Pisciculture en étangs de SAN
- PHASE - 11-

PAYS : MALI | Régions : Mopti
Ségou | SECTEUR : PISCICULTURE
Sikasso

Ministère et Direction Concernes : Ministère Chargé du Développement Rural
Direction Nationale des Eaux et Forêts

BUTS DU PROJET : Production en étangs d'alevins et de poisson d'embouche, vulgarisation de la technique d'élevage du poisson, aménagement des cours d'eau et recherche sur la biologie des espèces locales en vue de leur utilisation en pisciculture.

COUT TOTAL APPROXIMATIF : 248 016 000 FM | Financement extérieur demandé :
217 596 000 FM

DESCRIPTION DU PROJET : le projet prévoit à :

S A N

- la construction de neuf étangs
- l'équipement du Laboratoire de contrôle
- l'alimentation des bâtiments en eau et électricité par la réalisation d'un forage et l'installation d'un groupe électrogène.
- l'acquisition d'un véhicule tout terrain.

N I O N O

- la construction de 6 étangs (alevinage)
- l'acquisition d'un groupe moto-pompe
- l'acquisition d'un véhicule tout terrain
- l'acquisition de 4 motos
- la construction d'un bureau - magasin
- la construction d'étangs familiaux de vulgarisation

M O P T I

- l'aménagement des petits barrages du pays Dogon en collaboration avec le laboratoire d'hydrobiologie de Mopti.

S I K A S S O

- La construction d'étangs familiaux de vulgarisation.

DURE : 3 ANS

Date souhaitable de démarrage

1983

Suite à une Opération déjà
Amorcée : Oui
Source de Financement
Extérieur.....

Dossier élaboré par
la Division Pêche et Pisciculture
Direction Nationale des Eaux et Forêts
B.P. 275 BAMAHO

APPENDIX #4

" Amélioration de la qualité de la vie en Afrique rurale en développant les ressources hydrauliques, la production agricole, et les services de santé "

SAN PILOT FISH PRODUCTION PROJECT

MALI, WEST AFRICA

AID OPG/Nº. 688-0220 /

ELEVENTH REPORT

APRIL 1 - JUNE 30, 1982

Submitted to:
Agency for International Development
October, 1982

The general objective of the grant is to undertake a program for improving the quality of rural life among the people of the 4th region of Mali through the enhancement of the quality and quantity of protein available to them for local consumption, while seeking simultaneously to enhance their cash incomes.

SAN FISH STATION

The station, which is essentially a fish reproduction operation, consists of nine ponds that comprise a total surface area of 2,750 m². Actual operation began December 17, 1981 with the arrival of 1,090 fingerlings from Bouaké, Ivory Coast. There was a loss enroute of 43 fish, leaving a balance of 1,047. As a result of this small order of fish, only 6 ponds were activated thus providing a total surface area of 1,000 m² — i.e., 1 fish/m².

The following chart shows the distribution and weight of the 1,047 fingerlings from Bouaké:

DISTRIBUTION AND WEIGHT OF FISH

POUNDS	NUMBER OF FISH	AVERAGE WEIGHT: IN GRAMS	TOTAL WEIGHT: IN GRAMS	SOURCE OF ORIGIN
N°1 = 1 are	130	12	1,560	Bouaké
N°2 = 1 are	130	12	1,560	"
N°3 = 1 are	130	12	1,560	"
N°4 = 1 are	130	12	1,560	"
N°5 = 1 are	130	12	1,560	"
N°6 = 5 are	397	12	4,764	"

Approximately one week after stocking these six ponds, the staff decided to stock the 7th pond experimentally using 5 Tilapia nilotica and 32 Clarias lazera from the Jani River for comparative purposes with the Tilapia from Bouaké. Following is a breakdown of the weight of these fish:

(1500' or 1200'.....) ()
 Average weight..... 30 grams
 Total weight 150 grams

MAREAS LAZERA

Number of fish..... 32
 Average weight..... 30 grams
 Total weight 1,600 grams

From both the biological and physiological points of view, the two species manifested the following characteristics:

- a) Rapid growth;
- b) Good reception of the artificial distribution of feed;
- c) Good efficiency regarding the conversion of the feed;
- d) Good tolerance for the density of the fish population and the environmental condition;
- e) High resistance to sickness and parasites;

The growth pattern and the weight of the fish from Bouaké was recorded in January, February, April, and June on the 17th day of each month. This operation consisted of sampling the weight of 10% of the fish per pond which yielded the following results:

RESULTS OF FOUR WEIGHT SAMPLES

BASED ON 10% FISH/POND

<u>DATE</u>	<u>AVERAGE WEIGHT/FISH</u>
January 17, 1982	32 Grams
February 17, 1982	110 --"
April 17, 1982	200 --"
June 17, 1982	350 --"

The fish from Bouaké began reproducing in April 1982 as evidenced by the initial appearance of nests and very young fish in the ponds at that time. As of May 11, 1982, there were thousands of fingerlings clearly visible in the ponds.

from the initial stock of 1,047, thus representing a loss of 277 or 26%. This loss has been attributed to a heavy influx of predators, namely frogs and kingfishers, which began shortly after the ponds were stocked. The following chart shows the results of the harvest in terms of the number of fish received/pond and the average weight:

RESULTS OF THE FIRST HARVEST

POUNDS	NUMBER OF FISH HARVESTED	AVERAGE WEIGHT IN GRAMS/FISH	TOTAL WEIGHT IN KILOGRAMS/ADULT FISH	SOURCE OF ORIGIN
1	80	350	28.00	Bouaké
2	76	350	26.60	"
3	111	310	34.41	"
4	90	350	31.50	"
5	103	360	37.08	"
6	310	380	117.80	"
TOTAL.=	770	350	275.39	

The 7th pond, which was stocked with the 5 Tilapias from the Dani River that averaged 30 grams/fish, yielded a total of 134 adult fish that averaged 355 grams or 49.7 kilograms, not including the additional fingerlings. This indicates that this lot began reproducing well in advance of those from Bouaké. No statistical record was kept for the Clarias Lazera, however, although they provided an exceptional yield.

After harvesting the genitors, which by the way was done using a drag-seine or draw-net, an approximate total of 202,000 fingerlings was collected that weighed approximately 522 kilograms with an average of 387 fingerlings/kilogram.

During this 6-month period, the following two methods of feeding the fish were employed in order to provide a balanced diet consisting of a good proportion of proteins, which is an essential factor in pisciculture in order to obtain the best results:

amounts of fertilizer 1/4 wheelbarrow of lime was applied to each pond every 15 days.

- b) Direct feeding, which consisted of providing a mixture of rice flour and fresh cow's blood.

FEED SUPPLY: COMPOSITION USED

COMPOSITION OF FEED	PERCENTAGE	QUANTITY OF PROTEIN	PERCENTAGE OF PROTEIN
RICE FLOUR	72%	9.2 kilograms	15.2%
FRESH BLOOD	28%	6.0 kilograms	

Based on satisfactory results gotten from testing water and soil samples from the ponds, the project staff had been quite encouraged and reasonably certain that the fish would develop normally. This initial harvest clearly bears out their expectation and clearly demonstrates the feasibility of pisciculture for Mali.

The following chart shows the chemical composition of the water based on tests of the ponds, the main canal, and the Dani River:

CHEMICAL COMPOSITION OF THE WATER

SOURCE	P.H.	O ₂	CO ₂	C. A. C.
Pond 1	6.75	5 PPM	15	51.3 PPM
Pond 2	7.00	6 PPM	10	68.4 PPM
Pond 3	7.00	6 PPM	20	51.3 PPM
Pond 4	7.75	6 PPM	10	34.2 PPM
Pond 5	8.00	6 PPM	10	68.4 PPM
Pond 6	7.50	7 PPM	10	51.3 PPM
Water from the canal	7.50	8 PPM	10	51.3 PPM
Water from Dani River	7.50	9 PPM	10	51.3 PPM

In the very near future.

In spite of the tremendous effort exerted during this reporting period to start-up the extension component of the project, the staff was unable to develop the desired demonstration ponds in the Office du Niger section of Segou. This was due primarily to the Peace Corps Volunteers' failure to make their contribution to the project. Nevertheless, Africare and Eau et Forêts intend to begin full operation of the extension component immediately after the end of the 1982 rainy season, with or without Peace Corps participation. It appears that January-May is the most suitable period for the farmers in Niomo to engage in pisciculture.

Due to an inadequate supply of chemicals and other materials, the laboratory has not yet become operational. However, lab work should also get underway shortly after the rainy season ends.

As of the end of this reporting period, the project staff had decreased by one-half. Guimba DIALLO, the Eau et Forêts technician formerly in-charge-of the extension component, was withdrawn from the project by Eau et Forêts for reassignment. The two Peace Corps Volunteers (Faniela Schwartz and Jerome Pier), who were also assigned to the extension component, were withdrawn from the project, for reasons yet to be explained, and reassigned to a Peace Corps program in another country. Another Eau et Forêts technician (Moussa NIEMTAO) who received pisciculture training in Douakó, is temporarily on administrative leave undergoing army-reserve training. Thus, there are presently 4 persons actively assigned to the project: Adama Sanogo, manager of the station and Mohamed L. Traore who is in-charge-of extension work, both of whom are Eau et Forêts technicians; also assigned to the station are 1 guardian and 1 laborer. The present size of the staff is quite adequate.

Project equipment consists of one Landrover, (6) Suzuki motorcycles, and 1 typewriter, each of which is in good running condition, excluding one motorcycle that was assigned to Guimba DIALLO. This vehicle is in need of repairs.

The first harvest took place June 12, 1982 and was satisfactory, in spite of all the difficulties encountered during this first period of production and reproduction, namely the water shortage and pump problems. The acquisition of a new pump is being seriously considered as a possible solution to these problems. On May 1, 1982 the Compagnie Malienne de Developpement Textiles (C.M.D.T.) assumed management of the Government water-pumping station which is located adjacent to both the fish station and the Bani River; it was formerly managed by Operation Riz. The station closed May 22, 1982 as usual and should resume operation the end of August 1982.



UNITED STATES PEACE CORPS/U.S.A.I.D FISH CULTURE PROJECT
REPUBLIC OF MALI
FINAL REPORT

Submitted by: Pam Schwartz and Jerome Pier,
Peace Corps Fisheries Volunteers

June 14, 1982

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- I Introduction
- II Organization of Office du Niger
- III Problems Encountered
- IV Recommendation
- V Field Notes
- VI Conclusion

Introduction

We came to Mali in November of 1981 to assist the government of Mali in starting a fish culture program. We were stationed at Office du Niger, an area of 53,288.59 hectares irrigated for rice farming in the region of Segou, in January 1982. We were to do extension work with farmers, teaching them to build ponds, grow, harvest, transport and market their fish.

As the terrain of Office du Niger is quite flat (a slope of 0.5% is rare) we needed to find sites where there was an elevation of at least 40 centimeters between the surface of the soil and the water level in the drain. We found notsites that fit this requirement as all the drains are full for certain months of the year and can not be emptied.

Organization of Office du Niger

Office du Niger takes its water from the Niger River, which is dammed at Markala. The Canal du Macina takes the water to Point A, at Macina. When water is needed at Office du Niger, the watergates are opened at Point A, allowing water to travel up the seventy kilometer Canal du Sahel to the fala (reservoir) at Niono. Water is taken to each sector of Office du Niger by a distributeur. Each village has one or more partiteurs that branch off of the distributeurs. Arroseurs take water in to the rice fields and gardens. The partiteurs and arroseurs either dead end or end in a drain.

For administrative purposes the Office du Niger is divided into sectors, such as Molodo and Sahel. Each sector is divided into several Unités de Production (UP). Each Unité is divided into villages. Each village has one or two moniteurs, who report to the Chef d'Unité, who reports to the Chef du Secteur, who reports to the Chef Agricole at Niono, who reports to the direction at Segou.

Office du Niger
|
sectors - chef.
|
Unités de Production - chef.
|
villages - moniteurs

Problems Encountered

Drainage

Each sector of Office du Niger is drained by a main drain which can be from thirty to sixty kilometers long. The secondary drains and canals that run through the rice fields all eventually drain into the main drains. Our fish ponds would drain into the secondary drains or canals.

The drains in Ndebougou, Molodo, Niono and Sahel were built in the 1930's and have never been dredged. In some Unités the secondary drains are at the same level as the fields. In about half of the Unités visited the secondary and main drains are flooded as soon as irrigation starts in April and remain flooded until January. In the other half the drains are flooded during the months of September through January.

Most of the monitors and Directors of Unités and Sectors have requested that Office du Niger's Bureau de Travaux dredge their drainage systems but this has not been done due to lack of funds.

Without full and complete drainage of ponds, though a harvest of mature fish will be possible, fry and fingerlings (juvenile fish) would be impossible to remove. If left in the pond accurate stocking is impossible and the carrying capacity of the pond will be exceeded during subsequent growing seasons. This will result in harvests of fish of far below market size.

Water Supply

There are water shortages from time to time (April to June) in the Office du Niger, when it is not possible to have the desired level of water in the canals. The evaporation rate in the area is estimated by Project G. eau to be at least one centimeter a day, which would necessitate adding water to the ponds at least once a week.

When the watergates are opened at "Point B" of the fala to provide water for the sectors of Kourouma and Ndogofiry, some sixty kilometers away, the water level in the fala is lowered significantly, sometimes causing shortages in other sectors. This makes it necessary for the doors to be opened at Point A. The real problem arises during the months of April, May and June, when the farmers are irrigating their fields and the level of the Niger River is at its lowest. It is possible that a farmer might have to wait for over a week for water for his pond, even stretching into two or three during years of little rain. *-Rain in Guinea*

Problems Encountered, continued

Dike Condition

The seals between partiteurs and arroseurs are in many cases in poor condition and rarely provide a hermetic seal. In addition many of the arroseurs are in poor condition and leak into the fields. In the months when the rice is being threshed the fields are drained as completely as possible and the water level in the partiteurs and distributeurs is kept low. If a high level of water in a partiteur were required to fill a pond in many cases it would cause water to leak into the fields. It is possible that Office du Niger will refuse to provide water for ponds where it will interfere with threshing - a duration of a month or more.

Recommendation

According to Lamine Mohammad Traoré, the Director of Extension for the Fish Culture Project, Office du Niger is the only site in Mali where water can be found all year round. The goal of this project is to help Malian farmers grow fish. As suitable terrain for this is not available in Mali we recommend that the project be terminated.

FIELD NOTES

Sectors of Molodo, Niono and Sahel Surveyed by Pam Schwartz, PCV

Sahel

- spoke with André Zerbo, Chef du Secteur
- Sahel is drained by the Retail and Gruber drains. Both are flooded during irrigation and can't be emptied for harvest
- in some cases the drains flood the fields and make it impossible for the machinery to enter the fields to thresh the rice
- 500 hectares of rice fields have been abandoned due to flooding

UP 1

- spoke with Chef d'Unité Daba Diawara and village monitors
- saw the sites, did measurements
- all possible drainage flooded during irrigation

UP 2

- visited villages with Benta Dounbia, Adjoint Chef du Secteur
- no sites with adequate drainage

UP 3

- spoke with Moussa Famanta, Chef du Secteur
- saw sites with Famanta
- all drains completely full during irrigation and harvest

Niono

- spoke with Fafré Diarra, Chef du Secteur
- UP 4 and UP 5 drain into the Gruber which is full from May to January
- Up's 1, 2 and 3 are drained by the Kouia and Siebougou drains
- Kouia is in very poor condition and barely drains
- Siebougou was partially dredged by Project G.eau this year and should work

UP 1

- visited sites with monitors and farmers
- no adequate drainage as the UP's system is rather primitive
- same problem with adequate water supply

UP 2

- saw sites with Adjoint Chef du Unité
- drained by the Siebougou
- in the past severe drainage problems have been experienced
- Project G.eau's improvements seem to be helping but many problems are becoming apparent as the farmers start to irrigate their fields
- possible sites either had no adequate drainage or are flooded

Field Notes continued

Niono

UP 3

- spoke with Chef d'Unité Diarra and several farmers
- the UP is drained by the Kouia which is flooded for several months of the year
- all rice field drains are flooded and threshing is always late due to farmers' inability to drain their fields

UP 4

- looked at sites with Chef d'Unité Fuseini Angovba
- drains full during rainy season
- partiteurs G2 and G3 can't get water during several months of the year

UP 5

- looked at sites with Chef d'Unité Boubakar Maega
- all drainage is flooded from preirrigation through to threshing, about eight months of the year

Molodo

- spoke with Elias Goro, Chef du Secteur and his Adjoint, Modibo Bocoum
- from November to January the fields can't be drained for harvest and threshing due to the poor condition of the drains

UP 1

- saw sites with Chef d'Unité Mohaman Didia Sissé
- UP 1 has the worst drainage of all of Molodo
- in many areas the drainage is at the same level as the fields and thus is physically impossible

UP 2

- saw sites with Chef d'Unité Diko
- five of the villages had no drainage
- the sixth village, Missira has been overhauled by World Bank and should drain well but the soil is far too sandy for pond construction
- the dikes of the fields and partiteurs, which were machine built and compacted a year ago, are badly eroded and leaking

UP 3

- looked at sites with Adjoint Chef d'Unité Fassoum Diarra
- all drainage flooded during irrigation and rainy season

Field Notes continued

Molodo

UP 4

- spoke with Nouhoum Daow, Chef d'Unité
- all drains are full for four to eight months of the year
- drainage for harvest and threshing is nearly impossible

UP 5

- spoke with Breman Jabi, Adjoint Chef d'Unité
- drains full for four to eight months of the year

Sectors of Kourouma, Ndogofiry and Ndebougou
Surveyed by Jerome Pier, PCV

Kourouma

- spoke with Mr. Diallo, Chef du Secteur and Mr. Fofana, Adjoint Chef du Secteur
- saw sites with Mr. Fofana
- inadequate drainage during irrigation and rainy season
- inadequate water supply during threshing

Ndogofiry

- spoke with Mr. Koné, Chef du Secteur and Mr. Diallo, Adjoint Chef du Secteur
- saw sites with Mr. Diallo
- lack of any kind of drainage system
- lack of irrigated sites

Ndebougou

UP 1

- spoke with Mr. Camera, Chef d'Unité
- saw sites with Mr. Dembélé, monitor for Village B-2
- lack of adequate drainage at all sites; the sites drain into swamps and are completely flooded during rainy season
- arroseurs are in poor condition

UP 2

- saw sites with Lamine Traoré, monitor of Village BE-4-2
- many gardens irrigated by hand dug wells, no drainage, insufficient water.
- arroseurs which would not drain during irrigation and rainy season
- gardens are flooded during rainy season
- drainage poor due to flooding of main drainage canal

UP 3

- spoke with Chef d'Unité
- the entire unité is lower in elevation than the surrounding Unites, thus drainage is impossible during most of the year

UP 4

- spoke with M. Penboulba, Chef d'Unité and Mr. Meaga, Adjoint d'Unité
- saw sites with Mr. Meaga
- sites drain into swamps, drainage impossible during rainy season
- some sites had no drainage whatsoever

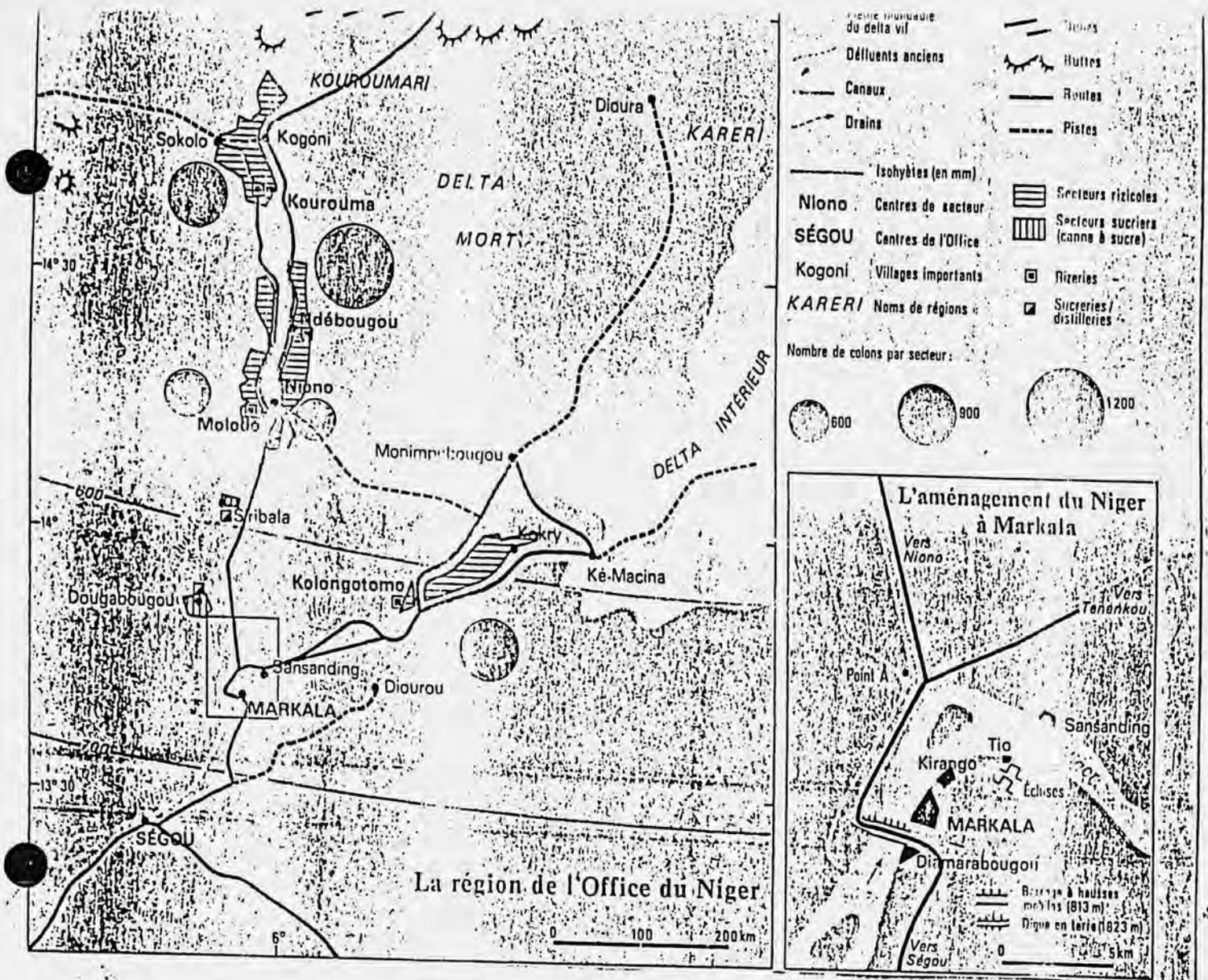
N'debougou cont.

UP 5

- spoke with Mr. Traoré, Chef d'Unité
- saw sites with Mr. Maega, Adjoint Chef d'Unité
- drains flooded during rainy season
- some sites had no drainage
- some sites had no adequate water supply

Conclusion

Fish culture is not possible in these three sectors due to a general lack of year round drainage. Fish culture at Office du Niger is restricted by the direction to land not utilized for rice production (i.e. gardens). Drainage is not a requirement for gardening, hence in many gardens none is provided. Those gardens with drainage possibilities are those connected with rice field drains.. However, due to the poor or complete lack of drainage during irrigation and rainy season in the rice field drains it is not feasible to utilize this option. The reason for poor rice drainage is due to the poor condition of the main drainage canals in all sectors. These canals have not been dredged since the French built them during colonization. During irrigation and rainy season the drains are filled and back up into the rice fields themselves, making drainage impossible. Since adequate drainage is needed all year round for the pond culture of Tilapia spp. I conclude that the drainage problems in the three sectors of Kourouma, N'dogofiry, and N'debougou preclude the possibility of fish culture.



Map taken from

Atlas du Mali

Les Editions Jeune Afrique, Paris, 1980.

(REPUBLIQUE DU MALI)

-UN PEUPLE - UNE BUT - UNE FOI-

REGION DE SEGOU

CERCLE DE SAH

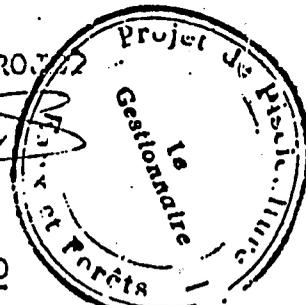
PROJET PISCICULTURE-SAN

-o- II A P P O R T - II E M E S T R I E L - C I R C O N S T A N C I E -o-
-----000ooo000-----

(II A N V I E R - à II U I N - 1982)

A retourner

LE CHEF DU PROJET

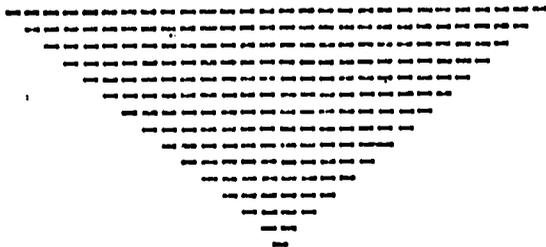


A. SANOGO

Ingénieur des Travaux Forestiers

AMPLIATIONS

- Division Pêche et Piscic. Mo... 2x
- Africare Bamako..... 1
- Corps de la Paix Bamako..... 1
- Direction Régionale E.F. Sékou 1
- Cercle San..... 1
- Cantonement Ptier San..... 1
- Archives..... 1/2



- 11 - Bê - Le
- Adama SANGHO Ingénieur des Travaux Forestiers
 - Sikasso Guimba DIALLO - " - " - "
 - Nou Moussa NIEMMO - " - " - "
 - Mohamed Lamine TRAORE - " - " - "
 - Mr. Jérôme Volontaire du Corps de la Paix
 - Mlle Pamela - " - " - "

b) MANOEUVRES

- Si-Miki SOITA : Manoeuvre Permanent
- Bakary KOITA : Gardien

c) MOUVEMENT DU PERSONNEL

A la date du 30 Juin le Personnel du Projet a ^{la Région} considérablement diminué. En effet Guimba DIALLO a été affecté dans de Sikasso. Les deux Volontaires du Corps de la Paix précédemment installés à Niouo, ont pour des raisons non justifiées quitté le Projet. Moussa NIEMMO est appelé sous le Drapeau

II.-

ETAT DU MATERIEL
-0-0-0-0-0-0-0-0-0-0-0-0-

- LE PROJET DISPOSE DE :
- Une Machine à écrire.....: Bon état
 - Une Land-Rover.....= Assez - Bon - état
 - Six Motos Suzuki Cross.....= Assez - Bon - état

Dans l'ensemble, sauf celle qui était affectée à Guimba DIALLO, cette dernière est en très mauvais état.

III.-

LA PISCICULTURE

La Pisciculture c'est l'élevage des poissons. Elle a existé chez nous sous une forme traditionnelle qui consiste à mettre en défend une portion d'eau (marre ou marigot) durant une période donnée et dont la pêche se fait collectivement. Exemple: la pêche historique de Sanké à San.

Compte tenu des aléas climatiques, cette pratique naturelle de la Pisciculture n'est plus fructueuse. L'élevage artificielle des poissons donc s'impose. C'est une technique qui est tributaire de certains impératifs se rapportant au degré de rusticité ou au degré de fragilité de l'espèce à élever :

- Une aménagement particulier des étangs avec essentiellement son système de renouvellement en eau
- Un rapport quotidien d'aliments
- Un Contrôle périodique de la croissance des poissons par pesées d'échantillons.

IV.- LA STATION PISCICOLE DE SAN

Elle comprend neuf étangs d'une surface totale égale à 2.750 M². Son fonctionnement a commencé, le 17-12-1982 avec l'arrivée de 1.090 alevins en provenance de Bouaké République de Côte d'Ivoire). Mais vu le nombre insuffisant de poissons reçus Six étangs seulement ont été chargés avec 1.047 individus, 43 d'entre eux étant morts à l'arrivée. Par ailleurs un étang de 4 ares a été également empoisonné quelques jours après avec des espèces locales (5 Tilapia Nilotica et 32 Clarias).

1°/- ESPECES PISCICOLES ELEVEES

- a) Tilapias Nilotica ou sorothérodon Niloticus: famille des Cychlidae (provenance Bouaké)
- b) Clarias Lazera : Famille des claridae (provenance Fleuve Lani)

Ces deux espèces de poissons ont du point de vue Biologique et physiologique :

- ~~Croissance rapide~~ *Accroissement*
- Croissance d'aliments artificiels distribués
- Bonne efficacité de conversion des aliments
- Tolérance de forte densité de population.
- Bonne tolérance des conditions du milieu (Nque.02)
- Haute résistance aux maladies et aux parasites
- Obtention facile des alevins chez le Tilapia surtout.

2°/- ///)ISE EN COURSE DES ETANGS :

L'empoisonnement a eu lieu le 17 Décembre 1981 à la densité de un alevin /M². Cette opération a intéressé Six étangs dont la superficie totale fait 1.000 M². Elle est aussi essentiellement une opération de reproduction qui permettra à l'avenir aux neuf étangs d'être opérationnels avec 5.500 alevins.

3°/- TABLEAU DE MISE EN COURSE DE TILAPIA NILOTICA

Best Available Document

.../...

	: ALEVINS	: EN GRAMME	: EN GRAMME	:
1-1arc	: 130	: 12	: 1.560 g	: Bouaké
2-1arc	: 130	: 12	: 1.560 g	: -"-
3-1arc	: 130	: 12	: 1.560 g	: -"-
4-1arc	: 130	: 12	: 1.560 g	: -"-
5-1-arc	: 130	: 12	: 1.560 g	: -"-
6-5-arc	: 397	: 12	: 4.764	: -"-
-----	-----		-----	
TOTAL 10 A.	: 1.047		: 12.564 ou	
			: 12,564 Kgs	

Un Septième étan a été aménagé d'alevins
de Milapia Nilotica (Bari)

Nombre = 5
Poids Moyen..... = 30 g
Poids total..... = 150g

Clarias Lazera

Nombre..... = 32
Poids moyen..... = 50 g
Poids Total..... = 1.600 g.

EVOLUTION DES POISSONS
-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-

Le Contrôle de la croissance des alevins s'effectue à chaque 17 du mois en cours. L'opération consiste tout simplement à prélever un échantillon de 10% de poissons au niveau de chaque éta ainsi le poids moyen est déterminé après les différentes pesées.

a) RESULTATS DES DIFFERENTS CONTROLES

D A T E S	: M O I S	: P O I D S M O Y E N
17/1/1982	: Janvier	: 32 g.
17/2/1982	: Février	: 110 g.
17/4/1982	: Avril.....	: 200 g.
17/5/1982	: J U I N	: 350 g.

et de très jeunes alevins.

Les poissons ont ainsi séjourné six mois durant dans les étangs avant d'être récoltés à ^{un} poids moyen de 350 g. Cette récolte a eu lieu le 19 Juin 1982.

b) RESULTAT A LA RECOLTE

ETANGS	NUMBRE DE POISSONS RECOLTES	POIDS MOYEN EN GRAM./POISSON	POIDS TOTAL EN KG/P. ADULTES	PROVEN.
N°1.....	80	350	28 Kg	Bouaké
2.....	76	350	26,5"	"
3.....	111	310	34,41	"
4.....	90	350	31,50	"
5.....	103	360	37,08	"
6.....	310	380	117,8	"
TOTAL.....	770		325 Kgs	

Il a été constaté à la récolte 770 poissons sur un nombre de 1047, soit une perte de ²⁸%. Cela est dû au fait que les étangs sont envahis de prédateurs. (Grenouilles, martin-Pêcheurs)

Les Tilapias venant du Dani se sont reproduits d'une manière extraordinaire. En effet pour 5 alevins de 30 g au départ, nous avons obtenu à la récolte 134 individus dont le poids moyen faisait environ 355 g. soit un poids total de 49,7 Kg. sans tenir compte des alevins. Leur reproduction a donc commencé avant celle des poissons venu de Bouaké.

() c) RECOLTE D'ALEVINS

Le nombre d'alevins collectés après la capture des émetteurs s'est élevé environ à un chiffre de 202.014

- Poids Total d'alevins.....= 522 Kg environ
- Nombre d'alevins par Kg.= 207 individus

.../...

L'Obtention de meilleurs résultats en Pisciculture est facteur essentiellement d'un régime alimentaire équilibré des poissons.

Les Aliments distribués doivent contenir en bonne proportion les éléments nutritifs tels que : Protéines, Glucides, Lipides.

Les poissons de notre station ont donc été nourris de deux manières :

a) ALIMENTATION INDIRECTE

Elle est assurée par l'action de la fertilisation qui est constituée de :

- ZOOPLANKTON: Essentielle des organismes vivants et flottants dans les eaux dont; les mouvements propres sont insuffisants à contre carter les mouvements de la surface liquide.

- PHYTOPLANKTON Les Phytoplanctons produisent l'oxygène le jour et de Gaz carbonique la nuit (Fonction Chlorophyllienne)

- BENTHOS : Constitué d'invertébrés aquatiques vivant sur le fond des étangs.

b) ALIMENTATION DIRECTE

Elle a été assurée par la distribution à raison de deux Kg are d'un aliment artificiel composé: de mélange de farine base riz et de sang frais disponible à l'abattoir.

c) TABLEAU RECAPITULATIF (de la mise en charge à la récolte)

MISE EN CHARGE				VIDANGE - RECOLTE				
Etang:	Nombre : alevins:	POIDS M. en gramme:	Poids Total en Kg.	Nombre : adultes :	Poids.M. G.P/Pois.:	Poids % (Kg)	Poids : alv.Kg.:	QN.
1	: 130	: 12	: 1,560	: 80	: 350	: 28	: 58,1	: 3
2	: 130	: 12	: 1,560	: 76	: 350	: 26,5	: 35	: 3,8
3	: 130	: 12	: 1,560	: 111	: 310	: 34,41	: 51	: 2,9
4	: 130	: 12	: 1,560	: 90	: 350	: 31,50	: 65,2	: 2,8
5	: 130	: 12	: 1,560	: 103	: 350	: 27,08	: 58	: 2,4
6	: 397	: 12	: 4,764	: 310	: 380	: 117,8	: 174,3	: 1,5
Tani	:	: 30	: 0,150	: 134	: 355	: 49,7	: 31,2	: 1,8
otaux	1.052	:	14,774	: 904	:	: 32,508	: 522	:

REMARQUE: On est le notation nutritif qui permet de déterminer la qualité de l'aliment utilisé.

VI.- VULGARISATION
-o-o-o-o-o-

Il n'est pas encore opérationnel faute de Produits et de matériel approprié.

VII.- VULGARISATION
-o-o-o-o-o-o-o-o-

Malgré tous les efforts consentis, elle n'a pu commencer en 1982. Cependant les premiers jalons sont déjà fixés, et dès la fin de la saison pluvieuse une action concrète sera entreprise dans le secteur de Niono avec ou sans volontaires du Corps de la Paix

VIII.- C O N C L U S I O N
-o-o-o-o-o-o-o-o-o-o-

La première récolte de poissons a eu lieu le 17 Juin 1982. Les résultats, nous pensons ont été assez satisfaisants malgré toutes les difficultés rencontrées pendant cette première période d'élevage. La difficulté majeure déjà portée à la connaissance de toutes les autorités compétentes et qui reste toujours l'obtention d'une source d'eau sûre pour la Station, n'a pas trouvé jusqu'à présent une solution viable. L'acquisition d'une nouvelle moto-Pompe est déjà en perspective. Seulement nous pensons que malgré son coût l'installation d'une Pompe solaire mettra fin à tous nos maux. Cela permettra par ailleurs de construire des étangs de Vulgarisation au profit des Paysans qui sont beaucoup intéressés par la Pisciculture./.-