

AquaFish CRSP Mali Project

Aquatic Resource Use and Conservation for Sustainable Freshwater Aquaculture and Fisheries in Mali

**Third Annual Report
October 1, 2009 – September 30, 2010**

**Cooperative Agreement # 688-A-00-07-00044-00
Leader with Associates Award EPP-A-00-06-00012-00**

INTRODUCTION

The *Mali Project*, “Aquatic Resource Use and Conservation for Sustainable Freshwater Aquaculture and Fisheries in Mali,” operates through an award received from USAID/Mali under the “Leader with Associates” (LWA) award that established the AquaFish CRSP in 2006. The project had a planned span of three years (1 October 2007 through 30 September 2010), but was approved for a 3-month no-cost extension (NCE) at the end of the fourth quarter (on September 15, 2010). The NCE will allow the project to complete a final training and a final report.

The overall goal of the project is improving the productivity and income of producers in targeted areas of Mali through facilitation of access to technologies and building the capacity of stakeholders involved in freshwater fish farming and capture fisheries management. It is working in three thematic areas to:

- Facilitate access and adoption of improved aquaculture production technologies in targeted areas to increase and diversify the incomes of farmers,
- Build the capacity of the Government of Mali to develop and disseminate relevant technologies,
- Identify appropriate strategies for the implementation of integrated rice and fish farming in target areas,
- Help develop an appropriate fisheries management plan to ensure long-term viability and sustainability of capture fisheries in the target area, and
- Help establish linkages useful for further development of aquaculture and fisheries in Mali.

The Mali Project’s Three Thematic Areas: The Project’s three-pronged approach towards facilitating the development of sustainable aquaculture and good fisheries management in Mali is being applied through work in these thematic areas:

- *Pond Culture—Advancing Sustainable Freshwater Aquaculture Practices and Technologies* (Theme Leaders Charles Ngugi, Héry Coulibaly, and Mr. Boureima Traoré)
- *Rice-Fish—Promoting Sustainable Rice-Fish Aquaculture in Irrigated Systems* (Theme Leaders Liu Liping, Héry Coulibaly, and Mr. Alassane dit Sandy Touré)

- *Fisheries Planning—Building Community and Consensus towards a Fisheries Management Plan* (Theme Leaders Mrs. Nancy Gitonga, Héry Coulibaly, and Mr. Soumaila Diarra)

Theme I is working to identify, develop, and promote appropriate pond culture systems for implementation in Mali. Theme II is working to introduce appropriate adaptations of proven rice-fish systems, based on experience in China, into irrigated systems of the Niger River delta in Mali, and Theme III is seeking to involve local stakeholders in the process of developing sound fisheries management plans (co-management), working initially at Lake Sélingué.

South-South Approach: The *Mali Project* takes a South-South approach to development, by bringing the scientific expertise and practical experience of CRSP partners from host countries with more fully developed aquaculture industries to bear on the three primary theme areas of the project.

PRIMARY COLLABORATING INSTITUTIONS AND PERSONNEL:

AquaFish CRSP, Oregon State University, Corvallis, Oregon, USA

(Lead US Institution)

Hillary Egna, Principal Investigator
James Bowman, Project Coordinator
Dwight Brimley, Business Manager

Direction Nationale de la Pêche, Ministère de l'Élevage et de la Pêche, Bamako, Mali

(Lead Mali Institution)

Héry Coulibaly, Principal Investigator and Theme Leader for Themes I, II, & III (Pond Culture, Rice-Fish, & Fisheries Management), Direction Nationale de la Pêche
Boureima Traore, Collaborator, Theme I
Madi M. Keita, Collaborator for Theme II
Alassane dit Sandy Touré, Collaborator for Theme II
Soumaila Diarra, Collaborator for Theme III

Ministère de l'Élevage et de la Pêche, Bamako, Mali

Mme Diallo Madeleine BA, Minister

Kenyatta University, Kenya (Theme I Lead Institution)

Charles Ngugi, Theme Leader, Theme I

Shanghai Ocean University, Shanghai, China (Theme II Lead Institution)

Liping Liu, Theme Leader, Theme II

FishAfrica, Nairobi, Kenya (Theme III Lead Institution)

Nancy Gitonga, Theme Leader, Theme III

OTHER COLLABORATORS

Network of Aquaculture Centres in Asia-Pacific (NACA)

Derun Yuan, Assistant Theme Leader, Theme II

Fisheries Department, Government of Kenya, Nairobi, Kenya
Peter Nzungi, Frame Survey collaborator, Theme III

Mwea Aquafish Farm, Kenya
Charles Ngugi, Theme Leader, Theme I
James Mugo, Assistant Trainer, Theme I

PROGRESS MADE AND RESULTS ACHIEVED

Pond Culture

Workshops

Charles Ngugi travelled to Bamako on 10 January 2010, to lead two workshops supporting On-Farm Trials conducted under the Pond Culture theme. The first was a one-day workshop held to evaluate the success of technologies and practices adopted by farmers in the first set of On-Farm Trials, which had been run from July 2009 to January 2010, and the second was another one-day workshop to set up the second set of On-Farm Trials, which ran from January to June, 2010).

Farmer's registration and training for the On-Farm Trials Evaluation Workshop took place on Monday 11 January 2010. Farmers selected for participation in the evaluation workshop included those that were involved in the first On-Farm Trials plus an additional three farmers. During the evaluation, it was noted that stocking of the ponds, which had been scheduled for 15 July through 31 July 2009, had been delayed because the irrigation canal whose water the farmers depend on for filling their ponds was under repair. However, DNP staff reported that 6 farmers were able to successfully stock their ponds in time and harvesting began in early January 2010. All farmers who were in the first On-Farm Trials had harvested their fish by February 2010.

Charles again traveled to Bamako on 9 May 2010, to conduct two more workshops. The first was a one-day workshop on 10 May for DNP technical staff to train them on how to conduct a third set of on-farm trials. The second was the postponed workshop on record keeping, business plan development, and marketing of farmed fish, using models developed under AquaFish programs in Kenya and Ghana but modified and translated for the Mali project. A wrap-up meeting was held at the end of the workshop on Friday 14 May to talk about the third set of on-farm trials and future projections of Theme 1.

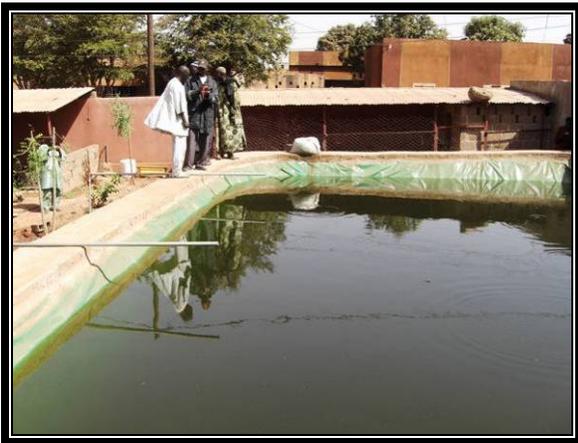
On-Farm Trials

Two sets of *On-Farm Trials* were planned as part of the project's *Pond Culture* theme during the course of the project. The first set of trials was begun in mid-July 2009, and ran until mid-January 2010. Ponds involved in the trials were monitored and sampled monthly by DNP personnel and our student participant Ahmadou Nouh Sow, from the Institut Polytechnique Rural de Formation et de Recherche Appliquée (IPR/IFRA) (Rural Polytechnic Institute for Training & Applied research), Katibougou. Sampling for growth was done periodically through the trial period and harvesting took place in January and February. Sample and harvest data were summarized for the evaluation carried out at the Bamako workshop in January. Presentation of

the harvest data was done by Boureima Traore, with other technical staff also providing input on data that they had presented to the DNP. Production from these trials ranged from 1,352 kg to 9,090 kg for one crop that took 6 months which translates into 2,704 to 18,180 kg/ha/yr. Records presented during this workshop were from six farmers who were among the 15 farmers initially selected for the trials. The results show that for these 6 farmers there has been a tremendous increase in production per unit area, moving up from the 1,500 kg/ha/yr estimated at the beginning of this project to a high of 9,090 kg/ha/6 months recorded during the trials (extrapolated this would be just over 18,000 kg/ha/yr).

During the first set of on-farm trials, Mamadou Kane, a dedicated DNP extension officer who had been trained in Kenya last year, died and so his farmers experienced a setback in their trials.

The second set of *On-Farm Trials* was initiated in January 2010, with stocking of the ponds occurring in February. Sampling for fish growth was scheduled for approximately one-month intervals in March, April, May, and June. Following the May workshops in Bamako, Charles Ngugi, Boureima Traore, and other DNP staff visited two of the participating sites—the Jigiya Association ponds in Kayo-Somono and Mofa Fofana’s farm near Baguineda—to assess fish stocking and growth. It was observed that the pond sizes in this set of on-farm trials ranged from 49.50 m² to 6,300 m². At Kayo, where fish were stocked on February 24th, sampling revealed average lengths of 15 to 16 cm and weights of over 80 g. At Mofa Fofana’s farm the fish had been stocked in January, including 5000 catfish in a 320 m² pond and about 5 MT of fish in a tilapia pond. Catfish sampled ranged from 28 to 33 cm, tilapia ranged from 15 to 23 cm. In June a fourth sampling of the ponds in this set of trials was carried out and all ponds were harvested. Evaluation of the results of this second set of trials and preparations for a third set were ongoing as of the end of this reporting period.



This pond near Bamako was selected for the second set of *On-Farm Trials* and stocked with African catfish (*Clarias gariepinus*).



One of the larger fish sampled from Mafa Fofana’s rearing tanks near Baguineda.

Spin-off Activities

Since his training under this project, both in Mali and in Kenya, Mr. Seydou Toé was not only instrumental in the construction of the hatchery at the Sotuba training center, but has also constructed a small hatchery facility at his own farm in Banco and begun producing catfish fingerlings for sale. To date he has sold all the fingerlings he has produced. Mr. Toe has also

conducted a number of other trainings around the country, starting with the training of 10 young people in Bougouni (approximately 160 km south of Bamako) in the techniques of pond construction and management in early November. Other trainings he has done include the following:

- Training of 40 producers in pond construction in Ségou in January 2010
- Training of 35 producers in pond management in Sanankoroba in February 2010_
- Training of 5 leading producers in pond construction in Gao in May of 2010.

Additional information about Mr. Toe is provided under “SUCCESS STORIES” later in this report.



Pond construction in Bougouni (Seydou Toé).



Pond construction in Gao (Seydou Toé).

Following the wrap-up of the first set of *On-Farm Trials* in January, the Malian and Kenyan theme leaders decided to set up and run a third set of trials. These trials were started near the end of the planned project period (August/September 2010), but will be monitored and evaluated beyond the project period by DNP staff. Ponds for those trials were selected in June.

The DNP reported that two new Koulikoro farmers took up fish farming during the fourth quarter of the year.



At left: A new fish pond in Koulikoro (Tandiacoro).



Tilapia raised at the Tandiacoro farm.



African catfish raised at the Tandiacoro farm.

Rice-Fish Culture

Workshops

Three rice-fish related workshops were held during this reporting year. Two of these were held in November and the third in January. Theme leader Liping Liu, along with Yuan Derun and Sun Tao, visited Mali in November to conduct two workshops as well as to harvest the four Baguineda area Rice-Fish Demonstration plots that were set up in July 2009.

The first workshop, “Workshop on Appropriate Aquaculture Post-harvest Technologies,” was held in Baguineda on 13-14 November. There were 24 participants in this workshop, including fishers, fish farmers, fish traders/marketers, processors, government officers responsible for aquatic food quality and safety, and researchers. The objectives of the workshop were to examine the current status of post-harvest processing practices, review the technologies available, identify constraints and problems in post-harvest processing, and recommend appropriate technologies for small post-harvest businesses. Yuan Derun reviewed aquaculture post-harvest technology and its roles in aquaculture development, poverty alleviation, food security, safety and aquaculture trade, and this was followed by Sun Tao’s presentation covering the details of post-harvest technologies, including cooling, drying and salting, and smoking fish. Alassane Touré reviewed current practices of aquaculture post-harvest processing in Mali. After that, Liu Liping introduced live fish and fish larvae transportation techniques. All the participants then discussed issues and constraints of rice-fish culture in Mali. The experts gave useful technical solutions to the workshop attendees.

The second workshop, “Workshop on Training and Extension Capacity for Rice-Fish Culture,” followed immediately after the first on 16-20 November. There were 27 participants in this workshop (including 7 government officials), which aimed to build training and extension capacity for government extension officers, university teachers, and others working to develop rice-fish culture techniques. The topics covered history, relevance, status, and development

trends of rice-fish culture, and rice-fish culture systems (including physical structure and construction, fish component, species choices, seed production, grow-out in rice fields, and feeds and feeding). Training and extension methods were also presented to help build training and extension capacity.

The third short-course was a four-day stakeholder workshop on “Best Aquaculture Practices (BMPs) and Aquaculture Policy in Mali,” organized by the DNP for approximately 20 participants, including fishers, fish farmers, middlemen, fish traders, government officers responsible for aquatic food quality and safety, and researchers from 31 January to 3 February 2010. The objective of the workshop was to generate recommendations regarding development and implementation of BMPs for Mali aquaculture through careful review of the current status of aquaculture practices and policies in Mali, critical examination of the existing guidelines and standards, and consultation with multiple stakeholders and experts. The workshop was led by Theme leaders Liping Liu (Shanghai Ocean University) and Alassane Touré (Direction Nationale de la Pêche), with assistance from Tang Jianye (SOU). The workshop covered international principles for responsible aquaculture practice, aquaculture status, practice and future development trends in Mali, current policy and regulations on aquaculture in Mali, code of quality and safety management for aquaculture in China, guidelines for drug use in aquaculture, tolerance for residue of drugs in seafood, integrated pest management, and tilapia culture and practices. It was followed by group discussion and brainstorming on aquaculture in Mali. Jeff Dorsey, who works in the Niono area and had contacted us during the previous quarter, attended the workshop and talked about rice-fish culture in Mali. Finally, a French translation of a document on fisheries standards in use in China, *Le standard industriel de la poissonnerie dans la République populaire de Chine*, was discussed and recommended for submission to the DNP as a reference for work in Mali. That document was included as Item 3 in Appendix 1 of our report for the 2nd quarter.

Rice-Fish Demonstrations

As reported earlier, four *Rice-Fish Demonstrations* had been started during the previous reporting year during the month of July. On 19 November 2009, the fish were harvested from the first rice field, that of Mamadou Samake. Mr. Samake’s harvest was observed by the participants of the Theme II training workshop and Mrs. Diallo Madeleine BA, Minister of the Ministère de l’Élevage et de la Pêche. More than 106 kg of fish were harvested from a field of approximately 840 m² (0.176 ha) in area. The harvest of 106 kg extrapolates to just over 1260 kg per hectare. This result was very appealing to Mr. Samake because of the additional income he was able to receive by selling the fish. His results have also generated a great deal of interest among other rice producers in the Baguineda area, a large number of whom began to make plans for going into rice-fish culture after the water supply was restored. All four demonstration sites were harvested between November 19th and 22nd. Students Fadima Keita and Bocary Diarra continued to assist with the rice-fish demonstrations right through the harvests.

Spin-Off Activities

After seeing rice farmer Mamadou Samake’s success in last year’s *Rice-Fish Demonstrations*, at least 21 new Baguineda-area rice farmers chose to adapt their rice fields for fish production during this year’s rice production season. This is a 5X increase over the four farmers who volunteered to participate in our first set of rice-fish demonstrations. Several new designs for the

layout of fish sump and access channels in the fields are being tried, and DNP technical officers have been monitoring the preparation and stocking of their fields, and with assistance from the OPIB, rice was planted into all of these fields in late June and July. Fish were then stocked and harvesting is planned for December 2010 and January 2011. CRSP trainee Alhassane Toure “Sandy” continues to be a leader for the DNP in this work. The rice-fish farmers of the Baguineda area have also formed a cooperative to better organize themselves for sharing and spreading this new technology.

Two additional farmers in the Mopti area have also taken up this technology, bringing the total of new farmers for this year to 23.

The DNP has been collaborating with other organizations, such as the IICEM and the Farmer-to-Farmer Program, to share information and set up training and demonstrations in areas such as Mopti. Trainees were producers, technical staff in Mopti and NGOs who are involved in the Tombouctou and Gao regions.

Fisheries Planning

Lake Sélingué Frame Survey

Last year (FY 09) a Frame Survey of Lake Sélingué was carried out by the Fisheries Planning team from 16-19 February, subsequent to holding two short training sessions for those who would be assisting with the survey (supervisors and enumerators). A database system was developed for storing and managing the survey data in early April 2009, and a report on the survey results (*Report on Lake Sélingué Frame Survey of February 2009*) was submitted to the DNP in May.

For maximum benefit to stakeholders and to Mali, and with co-management of the lake to conserve its fishery resources as the goal, the results and implications of the Frame Survey needed to be shared and discussed with all stakeholders. Two stakeholders’ workshops had thus been planned as a part of overall Theme III activities, and these workshops were conducted in FY 10.

Stakeholders’ Workshops

The two stakeholders’ workshops conducted this year included one in Bamako for the DNP fisheries management team and another at the ODRS offices in Sélingué for Lake Sélingué fishers. A PowerPoint presentation for reporting on the Frame Survey at these workshops was prepared by the workshop leader in Kenya prior to traveling to Mali in May 2010. This presentation touched on the Lake Sélingué fisheries database and how it operates, the results of the 2009 Frame Survey, and recommendations for the sustainable management of the resources of the lake, based on the survey results. The agenda for the stakeholders’ workshops was drawn up through e-mail consultations between Frame Survey expert Peter Nzungi, Theme III leader Nancy Gitonga, and DNP Director Héry Coulibaly.

Stakeholders Workshop for the DNP Fisheries Management Team

Two days (May 10th and 11th 2010) were given to the stakeholders’ workshop for the DNP fisheries management team held at the DNP offices. During the two days the Frame Survey

expert presented the results of the Frame Survey, the Lake Sélingué fisheries database and how it operates, and draft recommendations on sustainable management of the resources of the lake based on the Frame Survey results for discussion. This was done through an interpreter. Lively discussions ensued and the participants were happy with the results. They came up with several other recommendations which were included in the final survey report.

Stakeholders Workshop for Lake Sélingué Fishers

Another two days (12-13 May 2010) were given for the stakeholders workshop held at the ODRS offices in Sélingué for Lake Sélingué Fishers. During the workshop the Frame Survey expert presented the results of the Frame Survey and draft recommendations on sustainable management of the resources of the lake based on the Frame Survey results as well as additional ones suggested by DNP management. Again this was done through an interpreter. Just like the meeting with the DNP fisheries management team, a lively discussion followed the presentations and again the participants of this workshop were happy with the results. They also came up with several other recommendations which have been included in the final report. There were 33 participants in this second workshop.

Preparation and Dissemination of Final Frame Survey Report

After the stakeholders' workshops in May, the Frame Survey expert returned to Kenya and immediately began preparing the final Lake Sélingué Frame Survey report, which was submitted to the CRSP project coordinator James Bowman, DNP Director Héry Coulibaly, and Theme III leader Nancy Gitonga. In the report, the Frame Survey expert incorporated the views and recommendations obtained from the participants in the two stakeholders' workshops. The recommendations in the report are expected to facilitate "Sustainable Utilization and Development of Lake Sélingué Fisheries Resources"

Lake Fisheries Co-Management Training

On evaluation of the activities conducted under this project through FY 09, DNP Director Héry Coulibaly requested that we not hold a third Pond Culture training session in Kenya as planned, but focus those resources on additional Fisheries Planning training instead. At the team leaders meeting following the AquaFish CRSP Annual Meeting in San Diego, it was agreed that it would be in the best interest of the project and of fisheries development in Mali to respond favorably to the DNP director's request, and USAID agreed the project could substitute the refocused training.

The focus of this new training was on how fisheries management, and specifically co-management, has been successfully applied at Lake Victoria, Kenya. The training, conducted out of Kisumu, on the shore of Lake Victoria, thus took the form of a study tour, looking at 1) fisheries co-management, 2) monitoring, control, and surveillance systems, and 3) the formation and roles of Beach Management Units at Lake Victoria, Kenya. Through the addition of two extra days, it was also possible to expand the training in Nairobi to include the use of computer software for data storage, management, and analysis.

The DNP, FishAfrica, and the OSU Management Office put considerable effort into planning this revised training course during the 3rd and 4th quarters of the year, with dates for the training eventually set for 27 September through 3 October. To maximize the benefits of this effort for

Mali, four participants were sent rather than two. The four participants departed Mali on 26 September, arriving in Kenya on 27 September, and returned to Mali on 4 October. The results of this study tour will be presented in a workshop to Sélingué, and the documentation collected in Kenya will be used to develop guidelines for the wise use of the fisheries resources of Lake Sélingué. A full report on the training and its initial impacts will be included in the final report.

Other Project Activities

Activities of the Direction Nationale de la Pêche (DNP)

The DNP has been very active this year, participating in all work plan activities but also conducting follow-up/complementary activities for the three project themes and carrying out some supplemental new activities. Examples of follow-up work related to our themes are the initiation of a third set of *On-Farm Trials* (Pond Culture) and providing advice to Baguineda farmers leading to at least 21 new rice farmers investing in rice-fish technology during the present crop season (Rice-Fish). In addition, the DNP has engaged a local studio to videotape many of the field and classroom events that have occurred this year and will be producing several short videos to promote the aquaculture and fisheries activities that we have been involved in. The DNP has also taken responsibility for getting “signage” in place at our sites to show USAID sponsorship of our work. The Project Management Office assisted the DNP by creating the design for the signs using appropriate logos.

Mali Project Meeting, Annual AquaFish CRSP Meeting, and the World Aquaculture Society’s “Aquaculture 2010” Conference; San Diego, California, February 27 - March 5

Project team members in attendance at the Annual Meeting of the AquaFish CRSP and the “Aquaculture 2010” conference (World Aquaculture Society) in San Diego, California, from 1-5 March 2010, took the opportunity to meet to discuss project issues. DNP Director Héry Coulibaly was joined by Theme Leaders Nancy Gitonga, Liu Liping, and Charles Ngugi, and by Oregon State University PIs Hillary Egna and Jim Bowman for this meeting. USAID/Mali’s AOTR Gaoussou Traore was unable to attend the meeting due to a schedule conflict, although CRSP AOTR Harry Rea attended. This was a very productive meeting, involving the DNP Director, all three of the theme leaders, and the OSU PIs. It provided an opportunity for the team to thoroughly review progress made and to plan for the remainder of the project period, adjust the activity schedules of the three theme areas, and discuss potential activities for the future. And as reported above, an important part of the discussion focused on the idea of converting and replacing a *Pond Culture* workshop with one focused on *Fisheries Planning*.

At this meeting CRSP Director Hillary Egna invited Héry Coulibaly to serve as leader for the CRSP West Africa Regional Center of Excellence (RCE). This will further connect Mali into the CRSP framework while providing a way for Héry to bring his own networks in as well. In the entire AquaFish CRSP membership of 300 participants, there are only 4 RCE leaders, including Héry, so his role as RCE leader will be an important one. This recognition and role is projected beyond the life of the current Mali Project.

This also provided us with another opportunity to interact with participants in the wider AquaFish CRSP, both from the US and from participating Host Countries. Participation in the *Aquaculture 2010* conference brought all of us once again into contact with the global

aquaculture community, providing examples and models of what aquaculture can and does do in other countries and regions.

Participation in USAID/Mali All-Partners Meetings

December 2009

The purpose of this meeting was to provide a venue for USAID/Mali/AEG to describe the components of its economic growth portfolio to its partners and for the partners to share what they are doing with each other. DNP Director Héry Coulibaly represented the project at these meetings, making a presentation in which he outlined the project's three theme areas and highlighted the activities undertaken and results achieved to date. No other project team members were able to attend this meeting due to schedule conflicts at the time.

June 2010

In this meeting USAID/Mali/AEG sought input from its partners to help it prioritize potential economic growth programs for support under the *Feed the Future* initiative, with the Government of Mali's *National Priority Investment Plan* for 2011-2015 as the starting point. It also provided opportunity for brainstorming with regard to scaling up those program areas considered to be most important for Mali's economic growth. Participants were asked to take a broad view with regard to commodity prioritization and not to favor their own areas of interest. Boureima Traore (DNP) and Jim Bowman (OSU) attended this meeting on behalf of the project team. This two day meeting provided a great opportunity to meet representatives of the many other USAID/Mali partners and to learn about other value chains and their importance to the Malian economy; unfortunately there was not much time for in-depth discussions with those other partners.

OSU Management Office Activities

In preparation for the December 2009 All-Partners Meeting in Mali, the Management Office prepared a brochure and a fact sheet about the project along with PowerPoint material for the presentation made at the meeting by Héry Coulibaly. These are included in the Appendix to this report. We have also been developing a Mali Page on the AquaFish website, where project documents such as MOUs, subcontracts, and quarterly and annual reports are posted and where team members can log in and record indicator data such as numbers of short-term training events held and numbers of participants attending. We have prepared and submitted four quarterly reports (the first three have been translated to French and the fourth is being translated) and submitted annual indicator reports both in the USAID/Mali Excel format and through the GFSR M&E system (<http://gfsr.synisys.com/de/>). We set up at least five conference calls between Héry Coulibaly (DNP), Gaoussou Traore, Karen Ramsey, and Yacouba Santara (USAID/Mali), and Jim Bowman (OSU), and have had numerous SKYPE discussions with Héry Coulibaly.

As in the previous year the OSU Management Office prepared a poster about the Mali Project for display at the *Aquaculture 2010* conference. This poster covered the goals of our project, the approaches taken to achieve those goals, and progress made through January. Two French-language copies of the posters were also prepared and these were sent back to Mali with Héry Coulibaly. The French version was updated in May and five copies were printed and taken to Mali by Jim Bowman when he visited for the USAID All-Partners Meeting in June. Mini versions of the posters are included in the Appendix.

Amendments to OSU's subcontracts with the Direction Nationale de la Pêche (DNP), Shanghai Ocean University (SOU), and FishAfrica (FA) were finalized and became effective in December 2009, providing funding for Year 3 activities for these partners. Three additional amendments were later agreed on due to budget adjustments that needed to be made for the new fisheries planning workshop in Kenya.

Jim Bowman visited Mali in November 2009 and in June 2010, and Hillary Egna visited in August 2010. Both were able to visit some of the *On-Farm Trials* and *Rice-Fish Demonstrations* sites and the ponds of several farmers and farmer associations. Each also visited the Practical Aquaculture Training Center of Molodo (Niono, Segou area); the Office de Developpement Rural de Sélingué (ODRS), the ODRS hatchery, and the Carriere fish landing beach in Sélingué; and the hatchery and ponds of the Practical Training Center for Breeding at Sotuba. Both also had several opportunities to meet with the project's DNP and USAID partners, as reported in quarterly reports throughout the year. For his November 2009 trip to Mali Jim Bowman was fortunate to be able to pass through Kenya for an opportunity to meet with Theme Leaders Nancy Gitonga and Charles Ngugi to discuss project progress and problems, activity schedules, and indicator reporting. The meeting was hosted by Nancy Gitonga in her office at OAU headquarters in Nairobi.

The Management Office was intensively involved in planning and coordinating arrangements for the Lake Victoria co-management workshop, including the preparation of supplemental subcontract amendments for the DNP and FishAfrica, the two subcontracting institutions most closely involved in this training.

The Management Office requested a three-month no-cost extension (NCE) for the project and developed and submitted two proposals for future collaborative work to be led by the AquaFish CRSP. The request for an NCE was subsequently granted by USAID/Mali, extending our operating time through December 31, 2010. No feedback on the proposals has been officially received although there is indication of possible interest in continuation beyond the current project end date.

Summary of Training Efforts

Short-Term Training

The Mali Aquaculture and Fisheries Project utilizes on-farm trials, field demonstrations, and short-term training to test, adapt, and transfer appropriate aquaculture and fisheries technologies to its targeted audiences in the three theme areas. Training activities reach a wide audience of participants, including fishers, fish farmers, middlemen, fish traders, processors, government officers, and researchers. Most of the project's short-term training events have occurred in Mali, but some training has also been carried out in third countries, specifically China and Kenya. During FY 10, nine short-term training activities were conducted in Mali and one course was conducted in Kenya, as summarized in Table 1.

Table 1. Workshops conducted by the AquaFish CRSP Mali Project during fiscal year 2010. Two or more workshops were conducted under each of the projects three thematic areas, Pond Culture, Rice-fish Culture, and Fisheries Planning.

Event Name	Theme	Date	Location	# of trainees	# of women
Workshop on Appropriate Aquaculture Post-harvest Technologies	Rice-Fish	13-14 November 2009	Baguineda	24	9
Workshop on Training and Extension Capacity for Rice-Fish Culture	Rice-Fish	16-20 November 2009	Baguineda	27	0
Post-on-farm trials: 1 st evaluation workshop for supervisors and participating farmers	Pond Culture	11 January 2010	Bamako	14	2
Pre-on-farm trials workshop for supervisors	Pond Culture	12 January 2010	Bamako	6	1
Best Aquaculture Practices (BMPs) and Aquaculture Policy in Mali	Rice-Fish	31 January -3 February 2010	Baguineda	18	2
2 nd On-farm trials evaluation workshop	Pond Culture	10 May 2010	Bamako	6	1
Stakeholders workshop for the DNP fisheries management team	Fisheries Planning	10-11 May 2010	Bamako	12	0
Training on record keeping, enterprise budget, business planning in aquaculture and marketing of farmed fish	Pond Culture	11-14 May 2010	Bamako	14	3
Stakeholders workshop for fishers of Lake Sélingué at the ODRS offices in Sélingué	Fisheries Planning	12-13 May 2010	Sélingué	33	3
Training course in Kenya on lake fisheries co-management	Fisheries Planning	27 September -3 October, 2010	Lake Victoria, Kenya	4	0
TOTAL: 10 short-term events				158	21

The involvement of women in the trainings continues to be a challenge. Some of this is due to role distinctions inherent in Mali culture but some could be due to less entrenched reasons. The Management Office is gearing up for enhancing outreach towards women beneficiaries, possibly with additional funds dedicated to women's involvement in the next project. Given the de novo

nature of aquaculture in Mali, there could be lower barriers for women entrants but land and water rights, access to resources (info, credit, inputs), and perceptions of risk (vs. known low-risk outputs from labor) conspire almost everywhere in Africa to keep women from profiting. However, in Mali our experience with involving women was more segmented than in our other Africa activities. Fundamentally two years is inadequate time to bring in underrepresented groups, but with more time, funds, and up-front dedication, we think we can make a difference.



Theme II leaders awarded certificates to the participants attending the November 2009 Workshop on Post-harvest Technologies in Baguineda.



Technical staff and farmers during the Theme I *On-Farm Trials* workshop held in January 2010 in Bamako.

Long-Term Training

Although long-term training is not a major component of this project, three students from the Institut Polytechnique Rural de Formation et de Recherche Appliquée (IPR/IFRA) (Rural Polytechnic Institute for Training & Applied research), Katibougou, continued to receive partial support for participation in project activities this year. The students are Ahmadou Nouh Sow, who is associated with Theme I (Pond Culture) activities, and Fadima Keita and Bocary Diarra, both of whom are associated with Theme II (Rice-Fish) activities. Ahmadou Nouh Sow has been involved in monthly monitoring and sampling of the Theme I On-Farm Trials and Theme I workshop participation and Fadima Keita and Bocary Diarra were involved in monitoring and harvesting the Theme II Rice-Fish Demonstrations and participation in Theme II workshops.

Summary of Project Activities at Year's End

Year 1: October 1 2007 through September 30 2008

- ✓ **Nov 2007 to Dec 2008:** In Mali, ALL: [Planning design & review with Mali counterparts](#)
- ✓ **May to September, 2008:** Theme II: [Planning for Rice-Fish Demonstration and Workshop on Training and Extension Capacity for Rice-Fish Culture](#)
- ✓ **September 2008:** In China, Theme II: [Training on Rice Fish Culture plus Capacity Building for Effective Skills Transfer](#)
- ✓ **Continuous:** ALL: [monitoring, evaluating, and impact reporting](#)

Year 2: October 1 2008 through September 30 2009

- ✓ **Feb 2-6, 2009:** In Mali, Theme I: [Mali Pond Culture Workshop #1](#)
- ✓ **Feb 9-13, 2009:** In Mali, Theme III: [Frame Survey Training](#)
- ✓ **Feb 16-20, 2009:** [Frame Survey, Lake Sélingué](#) (two Theme III activities end-to-end)
- ✓ **Apr 6-17, 2009:** In Kenya, Theme I: [Kenya Pond Culture Workshops #1+2¹](#)
- ✓ **Jun 21-Jul 3, 2009:** In Mali, Theme I: [Mali Pond Culture Workshop #2](#)
- ✓ **Jul 15, 2009:** In Mali, Theme I: Start of [Pond Culture On-Farm Trials #1](#) (immediately following the Pond Culture Workshop)
- ✓ **Jun 26-Jul 15, 2009:** In Mali, Theme II: [Rice-fish demonstration set-up, first rice crop](#) (at beginning of rice season)
- ✓ **Continuous:** ALL: [monitoring, evaluating, and impact reporting](#)

Year 3: October 1 2009 through September 30 2010

- ✓ **Nov 12-14, 2009:** In Mali, Theme II: [Workshop on Appropriate Aquaculture Post Harvest Technologies](#)
- ✓ **Nov 16-20, 2009:** In Mali, Theme II: [Workshop on Training and Extension Capacity Building for Rice-Fish Culture](#) (just before harvest)
- ✓ **Jan 9-12, 2010:** In Mali, Theme I: Set up and start [Pond Culture On-Farm Trials #2](#)
- ✓ **Feb 1-4, 2010:** In Mali, Theme II: [Workshop on BMPs - the Issues and Challenges](#)
- ✓ **May 10, 2010:** In Mali, Theme I: [Evaluation and Wrap-Up, On-Farm Trials #1](#)
- ✓ **May 10, 2010:** In Mali, Theme III: [Stakeholders Workshop #1](#)
- ✓ **May 11-14, 2010:** In Mali, Theme I: [Mali Pond Culture Workshop #3](#)
- ✓ **May 12, 2010:** In Mali, Theme III: [Stakeholders' Workshop #2](#)
- ➡ **Sep 27-Oct 4, 2010:** In Kenya, Theme III: [Lake Management Training, Lake Victoria²](#)
- ➡ **September to December 2010:** ALL: [Final Reporting; Lessons Learned](#)

Key:

Theme I - Pond Culture

Theme II - Rice-Fish

Theme III - Fisheries Planning

All

✓ Items already completed

➡ In progress

¹ Two of the original three sessions (planned for 2 trainees each) combined into a single session with 4 trainees.

² The third pond culture training session was converted to this fisheries planning course at Lake Victoria.

Progress towards Impact Indicator Targets

Significant progress was made this year with respect to project impact indicators and targets, as shown in Table 2 (next page). The table consists of two sections, one for the five indicators required in the Work Plan and another for additional indicators that are being tracked to the extent possible. Note that we have exceeded our targets for some indicators.

Table 2. Impact indicators being tracked under the AquaFish CRSP Mali Project.

Required Indicators:

Indicator	Project Target	Results end of FY 2009	Results in FY 2010	New Total
New technologies under field testing	12	2 ¹	2 ¹	2
New technologies made available	4	6	2	8
Individuals receiving short-term training ²	155 (79/76)	124 (116/8)	158 (137/21)	282 (253/29)
Farmers who adopted new practices ²	16 (8/8)	17 (17/0)	26 (24/2)	43 (41/2)
Fish processors who adopted new practices ³	4 (2/2)	0	0	0

Optional Indicators:

Indicator	Project Target	Results end of FY 2009	Results in FY 2010	New Total
Number of Malians who attend international aquaculture meetings ²	3	4 (4/0)	1 (1/0)	5 (5/0)
Number of students trained or mentored in Mali ²	3	3 (2/1)	0 (0/0)	3 (2/1)
Number of participants trained outside of Mali ²	8	6 (5/1) ²	4 (4/0)	10 (9/1) ²
Additional aquaculture production area resulting from project efforts (either number of additional ponds or rice paddies or additional area in hectares)	1.4 ha	Not yet determined	Over 200 new ponds and 27 rice-fish paddies	Over 200 new ponds and 27 rice-fish paddies
Estimated increase in fish productivity in ponds or rice-fish systems in targeted areas (kg/ha/yr or percent)	1500 kg/ha/yr	Not yet determined	2,700 to 18,000 kg/ha/yr ⁴	2,700 to 18,000 kg/ha/yr ⁴
Estimated increase in income for fish farmers in targeted areas (CFA/ha/yr or percent)	Not yet determined	Not yet determined	180 to 1,200% ⁴	180 to 1,200% ⁴
Number of extension publications developed	10	12	10 ⁵	22 ⁵
Number of frame surveys conducted for lake fisheries	1	1	0	1
Estimated increase in income for fishermen in targeted areas (CFA/ha/yr or percent)	Not yet determined	Not yet determined	Not yet determined	Not yet determined

¹ Previously reported as 4 technologies; now re-defined as 2: Pond Culture and Rice-Fish Culture.

² The total number of individuals is followed in parentheses by the number of men/number of women. For example, an entry of 9 (5/4) would indicate a total of nine individuals, of which 5 were men and 4 were women.

³ Impacts related to processors are not expected to be apparent until late 2010.

⁴ In ponds of farmers participating in the first set of Theme I On-Farm Trials.

⁵ Includes PowerPoint teaching modules.

SUCCESS STORIES

Increases in Fishpond Productivity

One of the major goals of the project is to help fish farmers improve their practices to increase productivity. Results coming out of our *On-Farm Trials* this year show exactly the kind of increases we are looking for. Among the ponds of the six farmers who completed these trials, production ranged from 1,352 to 9,090 kg for a six-month crop cycle, which extrapolates to between 2,704 and 18,180 kg/ha/yr. This is a 2- to 11-fold increase in production per unit area over the 1,500 kg/ha/yr baseline estimated at the beginning of this project, and it shows the positive effect that occurs when farmers apply improved management practices provided to them through training and education.

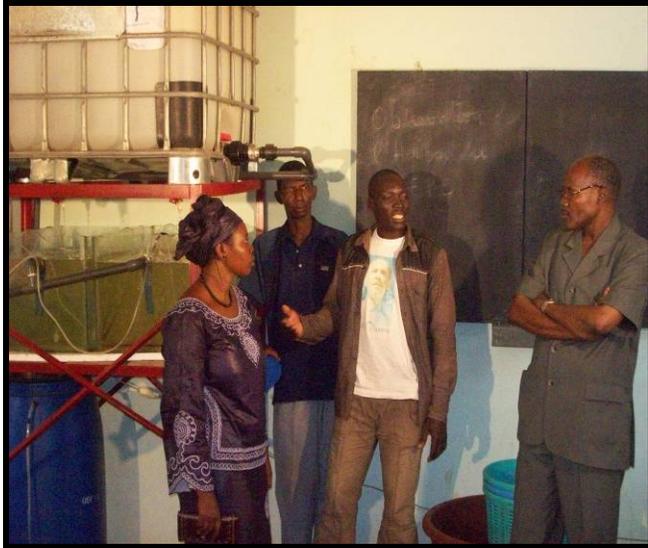
Fish Farmer Seydou Toé

We reported on Mr. Toé's initial successes in last year's report, but his story continues to be remarkable. Mr. Toé is an agricultural producer who has been practicing fish culture since 2006. His farm, operated in partnership with his brother Richard Toé, is at the edge of an arm of the Niger River in Banco, approximately 30 km southwest of Bamako. Seydou speaks neither French nor English, but speaks Bambara and writes N'Ko. He is a founding member of the Association des Pisciculteurs et Aquaculteurs du Mali (APAM) and has participated in four of this project's training courses.

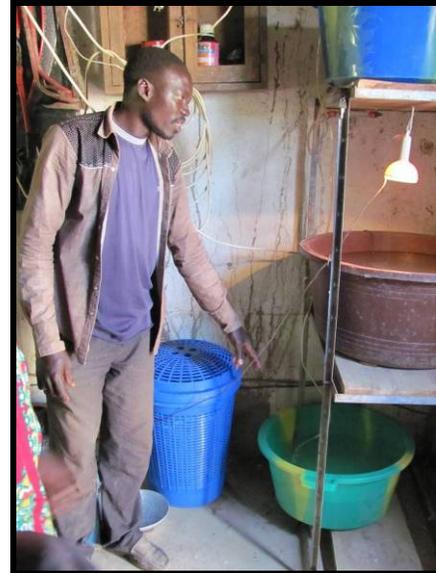
With respect to fish farming, prior to the beginning of this project, Seydou had been having problems related to poor construction of his ponds, lack of good feeds for the fish, lack of pond management information, and limited access to fingerlings. Some of his pond construction issues were related to high soil permeability, resulting in poor water retention in the ponds.

With respect to the activities of the USAID/AquaFish CRSP *Mali Project*, Seydou was selected by APAM to participate in the Theme I (Pond Culture) training workshops in Bamako and Sagana, Kenya, in February and April 2009, respectively. In these workshops he learned about pond construction and management and the propagation of *Clarias* (African catfish), including spawning, hatching, and the care of catfish fry in the hatchery.

On their return from the Kenya training course, Seydou and his fellow trainees constructed and tested a hatchery at the Centre de Formation Pratique en Elevage at Sotuba. This hatchery has been used in subsequent training sessions to hatch catfish eggs that are produced during courses on *Clarias* breeding and continues to be operated by APAM to produce *Clarias* fry.



The team members who were trained in the artificial propagation of *Clarias* (African catfish) at Sagana Aquaculture Centre in Kenya; from left to right: Rokia Coulibaly, Mamadou Kane, Seydou Toé, and Bouréïma Traore



Seydou Toé explaining the construction and operation of the *Clarias* (catfish) hatchery that he now uses at his farm in Banco.

Using locally available materials, Seydou also built a hatchery at his own farm in Banco. This year he continued to produce catfish fingerlings and market them to other farmers. His fingerling sales serve as an important source of income, enabling him to meet the various expenses of fish pond operation. He has also acquired additional land, with better soils for pond construction, where he plans to expand his fish farming operation.

In addition to the improvements he has made in his own fish farming work, Seydou is in high demand throughout Mali as a pond construction trainer. The fact that people are willing to pay him for his services is an indication that farmers see fish culture as a sustainable enterprise and understand that positive economic benefits can be gained from it.

The training Seydou has received under the AquaFish CRSP Mali Project, financed by USAID/Mali, has enabled him to identify good sites for pond construction, improve pond management at his farm, and produce fingerlings for sale to other fish farmers. Seydou now also contributes to the dissemination of the information he has received and technologies he has learned by training and advising other producers.

Catfish Fry Producer Rokia Coulibaly

New this year is the successful installation of another new catfish hatching system by another of the trainees who went to Kenya in 2009. Rokia Coulibaly completed a hatchery installation in June of this year and hatched her first batch of catfish larvae in July. The significance of the innovation of these simple hatching systems is that they are inexpensive, easy to construct, and easy to operate, so that many farmers or suppliers should be able to put them into operation. With many of them in operation around the country, catfish fingerlings should become much more readily available in close proximity to farmers who want to produce catfish.



Above, Rokia Coulibaly is using a hapa net and shading by banana leaves to nurse and protect newly-hatched catfish larvae.

At left, Rokia shows her newly completed catfish hatching system.

Rice-Fish Farming in Baguineda

Last year we reported on the success of rice-fish farmer Mr. Mamadou Samake in the Baguineda irrigation area. At that time he was one of the first rice farmers to try growing fish in a rice field, through his participation in the project's *Rice-Fish Demonstrations*. More than 106 kg of fish were harvested from his field at the end of demonstration period, which was very appealing to him because of the extra income that was generated.

The significance of that initial success this year is in the multiplier effect it has had among other rice farmers in Mali, especially in the Baguineda irrigation area, but elsewhere in the country as well. As an example, at least 21 new rice farmers in the Baguineda area modified their fields for rice-fish farming this year. In anticipation of the re-opening of the irrigation system, the new fields were modified in May and June, rice was transplanted in June, and the fish were stocked in July. New farmers are using not only the original design used by Mr. Samake, but are also trying out new field configurations. We eagerly await the results of these new undertakings in terms of fish production, income generation, and the comparative performance of the new field designs that are being tested.



Mme Diallo Madeleine BA, Minister of the Ministry of Livestock and Fisheries, visiting the farm of Mamadou Samake on harvest day.



Over 100 kg of fish were harvested from the rice-fish field of Mamadou Samake in November 2009.



One of the new rice-fish field designs, seen in early August, after rice transplantation and over a month of cultivation.



Another of the new rice-fish field designs, seen well after rice transplantation and significant rice growth.

Capacity Building for Fisheries Management

Last year the project conducted a *Frame Survey* of Lake Sélingué to provide baseline information about its fisheries from which the impact of management measures can be evaluated and improved management plans can be formulated. The survey provided information on the number of fish landing sites; the facilities available at the fish landing sites to service the sector, including accessibility to the landing sites; the service providers, especially fishermen cooperatives/associations; the number of fishers; the number and types of fishing canoes and their modes of propulsion; the types and sizes of fishing gear used on the lake and the mode of operation for gillnets. This allowed the *Fisheries Planning* team to develop recommendations on best approaches for managing the lake based on the information gathered.

This year Lake Sélingué stakeholders participated in two workshops to consider the implications of last year's Frame Survey and to begin to work together on plans for future management of the lake. In addition, four Malian stakeholders participated in a study tour of Lake Victoria, Kenya, where they visited fishing communities and members of *Beach Management Units* (BMUs), learning about Kenya's experiences in co-management of fisheries resources and how management responsibilities are shared among the three nations bordering the lake (Kenya,

Tanzania, and Uganda). Through completion of Lake Sélingué's frame survey, the formulation of management recommendations, participation in stakeholders' workshops, and exposure to how fisheries co-management is practiced in a major African lake, Lake Sélingué stakeholders are ready to develop a new management plan for the lake. In addition, Malians now have the capacity to conduct regular frame surveys at Lake Sélingué or other important Malian water bodies, analyze the results, and design good management strategies for those bodies of water.

Trainings in China and Kenya

Some of our best successes have had their beginnings in trainings conducted outside of Mali, for example, the *Rice-Fish* training conducted in Shanghai, China, and the *Pond Culture* training conducted in Kenya.

Participants Alassane Toure ("Sandy") and Tieman Traoré, who were trained at Shanghai Ocean University, China, in 2008, returned to share what they had learned there with farmers and OPIB officials in the Baguineda irrigation area. They were directly involved in setting up the four rice-fish demonstration sites in Baguineda in 2009. The success of rice farmers who participated in those demonstrations, particularly Samake, in turn generated so much interest among other Baguineda area rice farmers that at least 21 new farmers adapted their fields for fish production this year.

Likewise, participants who were trained at Sagana Aquaculture Centre, Kenya, in 2009 returned to construct hatchery facilities at public and private locations, train others in how to build and operate these facilities, and begin producing catfish (*Clarias*) fry and fingerlings on their own. Soon after their return the returnees constructed a catfish hatchery at Sotuba training center and two of them, Seydou Toé and Rokia Coulibaly, have constructed their own catfish egg hatching facilities on their own property. Seydou Toe has independently been involved in training of other farmers.

This past month four new participants went to Kenya for training in lake co-management and related topics at Lake Victoria. Initial reactions to the training are very positive and we expect to see good results in terms of the application of what they learned in Kenya to lake management in Mali, initially at Lake Sélingué but ultimately at other lakes and reservoirs as well.

The successes of these external training activities have occurred in spite of the language differences that exist, demonstrating again the value of the active, hands-on approach to training we have used and the extent to which language barriers can be overcome when trainees and trainers alike are excited about the subject matter and believe that they can overcome language differences to communicate effectively and achieve good results.

PROBLEMS ENCOUNTERED

Arrangements for some of the travel undertaken during this year were somewhat difficult, due to problems such as the long and complicated processes for getting visas for many countries these days and the need to meet "Fly America" requirements while keeping travel as straightforward as possible. In addition, in at least one case we found that confirmed reservations had at the last minute been cancelled without warning, requiring us to quickly make alternate flight

arrangements that resulted in higher fares, incurred penalties, and required more time for travelers to reach their destinations.

Wire transfers between the US and our partners have frequently taken much longer than hoped and expected. This may be due to the current economic atmosphere and the reactions of banking systems to it. We find that wire transfers tend not to go directly from our bank to theirs, but instead often have to wend their way through clearing houses and other banks, sometimes taking two to three weeks to arrive at the recipient bank. This has been problematic in cases where we needed to quickly get funds from OSU to our partners.

The distances between partners continued to make communications a bit difficult. This year we again benefited from having an opportunity to meet face-to-face during the conferences in San Diego in March. Several of us, including our DNP colleagues, have also been able to use SKYPE for discussions, and this does allow for much better communication than do email messages and regular telephone calls.

LESSONS LEARNED

Coordinating a collaborative effort that includes partners from three countries in addition to the host country requires a considerable extra amount of time, effort, and patience. As mentioned above, the simple physical separation makes communication more difficult, meaning that more time is usually required to reach consensus on important decisions or to receive and compile information for reports. When all of the partners are already involved in high-level programs of their own and one or more of them may be traveling at any particular time, it becomes even more difficult to make timely decisions and keep the collective activities moving ahead on schedule. This lesson became apparent to us early in the project but may not have been brought out in previous reports.

Tools such as *On-Farm Trials*, *Rice-Fish Demonstrations*, and *Stakeholders' Workshops* are extremely effective in sharing critical information and providing the kind of hands-on, practical experience that is needed for good learning. In our project we have found that participants in these activities were very enthusiastic, actively engaged, and excited about the material at the end of each activity.

More timely information and feedback from USAID regarding project extensions is required. Until mid-August, we were actually planning a closedown on 30 September. The university and partner agreements were ending and contract officers were beginning layoffs and closedown procedures. While we definitely appreciate the no-cost extension that was granted, it came at the 11th hour and caused higher transaction costs and extra work related to partner arrangements such as MOUs and subcontracts. This is likely to occur again in November, as we come up on the extended project end date. The organizations involved are large and complex and require greater lead time for actions such as responding to RFPs and negotiating MOUs and subcontracts.

If a new project is desired by USAID, planning for it would have benefitted from starting in early summer, at the time of the June workshop. The in-person communications that could have

occurred at that time, as well as the resulting increase in planning time, would have been far more conducive to putting together a solid project in a timely manner. Without the guidelines provided by an RFA, developing plans for future work competes unfavorably with onerous daily demands.

OUTCOMES AND IMPACTS

Notable impacts realized this year have included:

- *Success of farmers like Seydou Toé:* Seydou Toé's story continues to be one of real success. Seydou participated in training events both as a trainee and as an assistant to trainers, and has since greatly improved his own fish farming efforts. He has constructed his own simple catfish hatchery and is now producing catfish fingerlings for sale, has purchased new land for expansion of his fish farming enterprise, and is actively engaged in training other farmers in pond construction. He serves as the best kind of model for promoting fish farming in Mali, a model that can potentially have an enormous multiplier effect.
- *Improved management of pre-existing fishponds:* Following their training experiences, many farmers have returned home to apply their new knowledge to improve their pond management and productivity. Farmers who have participated in our *On-Farm Trials* have increased production to levels as high as 2,700-18,000 kg/ha/yr, as compared with the pre-project productivity estimate of approximately 1,500 kg/ha/yr.
- *Construction of new ponds:* Following participation in training sessions trainees have also gone home to construct new ponds based on what they learned about selecting suitable pond sites and using appropriate construction methods. This year the project team is reporting that over 200 new fish ponds have been built.
- *Application of simple methods for catfish propagation and hatchery management:* In 2009 a new hatchery was designed and installed at the *Sotuba Centre de Formation Pratique en Elevage* by participants returning from training in Sagana, Kenya. This year a second person trained in catfish propagation in Kenya, Rokia Coulibaly, has installed a small hatchery at her own property (Seydou Toé had installed one the previous year).
- *Expansion of fish farming by the Jigiya Association:* The Jigiya ("Hope") Association, an 11-member group that was formed last year in Kayo (near Koulikoro) and participated in the first set of *On-Farm Trials*, has built two additional ponds and acquired additional land for further growth.
- *Increased government capability in lake fisheries management:* This year Lake Sélingué stakeholders participated in two workshops to consider the implications of last year's Frame Survey and to begin to work together on plans for future management of the lake. In addition, four Malian stakeholders participated in a study tour of Lake Victoria, Kenya, where they observed the successful application of fishery co-management techniques that they and other stakeholders will adapt to the Lake Sélingué situation. That the stakeholders understand the results of the Frame Survey and are buying in to the recommendations made to date is illustrated by the fact that for the first time ever no

citations for harmful fishing practices were given to Carriere fishers by the fishing authorities.

- *Expansion of rice-fish culture:* The farmer-to-farmer effect was clearly seen in the Baguineda area this year, where based on the experience of the four farmers who participated in last year's rice-fish demonstrations, at least 21 new farmers adapted their rice fields and stocked fish this year. At least two other farmers have started rice-fish farming in the Mopti area, and the DNP has been providing support to other organizations who wish to support this technology in other areas.

SUMMARY

The Mali Project has made great strides again this year, completing ten short-term training activities involving 158 participants, complementing last year's Lake Sélingué Frame Survey with 2 stakeholders' workshops and a lake co-management study tour in Kenya, catalyzing the diffusion of rice-fish technologies within Mali, and conducting *On-Farm Trials* in fish farmers' ponds. Following their experiences in our training courses, participants have gone on to renovate poorly constructed fish ponds, build new ponds, correctly apply improved management practices to their fish ponds, begin small-scale fingerling production, and become involved in training others. The results of our first set of *On-Farm Trials* showed productivity of 2,700-18,000 kg/ha/yr in ponds that completed the trials, as compared with our baseline estimate of 1,500 kg/ha/yr at the beginning of the project. There continues to be great potential making significant contributions to aquaculture and fisheries development in Mali and the region, and we hope to continue to be a part of that effort.

Appendix: Project Posters, Brochures, and Fact Sheet



TOWARDS THE DEVELOPMENT OF SUSTAINABLE FRESHWATER AQUACULTURE AND FISHERIES MANAGEMENT IN MALI: COLLABORATIVE WORK UNDER THE AQUAFISH CRSP



James Bowman¹, Lisa Reifke¹, Héry Coulibaly², Charles Ngugi³, Yang Yi⁴, Liu Liping⁴, Nancy Gitonga⁵, Peter Nzungi⁶, and Hillary Egna¹

¹Oregon State University, Corvallis, Oregon USA, ²Direction Nationale de la Pêche, Mali, ³Moi University, Kenya, ⁴Shanghai Ocean University, Shanghai, China, ⁵FishAfrica, Nairobi, Kenya, ⁶Fisheries Department, Nairobi, Kenya

INTRODUCTION

In 2007 the AquaFish Collaborative Research Support Program partnered with the Direction Nationale de la Pêche (Mali) and collaborators from Moi University (Kenya), Shanghai Ocean University (China), and FishAfrica (Kenya) to begin the *Mali Project*, an effort to promote the sustainable development of the aquaculture and fisheries sectors in Mali. Support for the project is being provided by the Mali Mission of the United States Agency for International Development (USAID), through a cooperative agreement with Oregon State University.

The Mali Project works within the framework of three thematic areas: Pond Culture, Rice-fish Culture, and Fisheries Planning. For the aquaculture themes, the project seeks to identify appropriate strategies for pond aquaculture and rice-fish culture and to make those strategies available for implementation by farmers in selected areas. For the fisheries sector, it seeks to evaluate the present status of the Lake Sélingué fishery, identify fishery management concerns, and involve local stakeholders in the planning processes necessary for sustainable management of their fishery.



POND CULTURE



The objectives of the pond culture component are accomplished by providing hands-on training in pond construction, fish propagation, and pond management, and by conducting field trials to identify pond culture systems suitable for implementation in Mali. Summary of activities to date:

- POND CULTURE WORKSHOP IN MALI- February 2009, Bamako: 24 trainees
- CATFISH PROPAGATION /HATCHERY MANAGEMENT TRAINING- April 2009, Sagana, Kenya: 4 trainees
- CATFISH PROPAGATION /HATCHERY MANAGEMENT TRAINING- July 2009, Bamako: 22 trainees
- PRELIMINARY ON-FARM TRIALS WORKSHOPS- June 2009, Bamako: 20 trainees
- SETUP AND RUNNING OF ON-FARM TRIALS- July 2009 – January 2010: various locations in Mali

RICE-FISH CULTURE

This theme provides training and field testing and evaluates potential adaptations of rice-fish systems for introduction into irrigated systems along Mali's Niger River. Summary of activities to date:

- TRAINING COURSE ON RICE-FISH CULTURE- September 2008, Shanghai Ocean University, China: 2 Malian trainees
- WORKSHOP ON UP-TO-DATE TECHNIQUES FOR RICE FISH CULTURE- June 2009, Bamako: 21 trainees
- SETUP AND RUNNING OF RICE-FISH DEMONSTRATIONS- July – November 2009, Baguineda irrigation area: 4 rice farmers
- WORKSHOP ON APPROPRIATE AQUACULTURE POST-HARVEST TECHNIQUES- November 2009, Baguineda: 22 trainees
- WORKSHOP ON TRAINING AND EXTENSION CAPACITY BUILDING FOR RICE-FISH CULTURE- November 2009, Mali: 27 trainees



FISHERIES PLANNING

This theme provides assistance to the Mali Government in conducting frame surveys and involving local fishing groups in the development of sound fisheries management agreements, working initially in the Lake Sélingué area. Summary of activities to date:

- FRAME SURVEY TRAINING FOR SUPERVISORS- February 2009, Lake Sélingué: 11 trainees
- FRAME SURVEY TRAINING FOR ENUMERATORS- February 2009, Lake Sélingué: 20 trainees
- FRAME SURVEY OF LAKE SELINGUE- February, 2009
- ANALYSIS OF FRAME SURVEY DATA- Analysis completed and full report submitted to the Government of Mali June 2009



Stakeholder workshops to discuss the survey results, consider lake management options, and begin the planning process are planned for February 2010.

SUMMARY

Across its three themes, the project emphasizes creating capacity building opportunities, finding and promoting sustainable solutions to aquaculture and fisheries development, and fostering collaboration between the public and private sectors. Farmers, fishers and fishing communities, extension and technical personnel, and members of NGOs are the beneficiaries of the workshops, training courses, and field trials being conducted under this project. Through training and participatory field trials, recent and prospective fish farmers are learning current, practicable techniques for the culture of tilapia and catfish in Mali, rice producers are discovering and applying techniques for producing crops of fish alongside their rice crops, and members of Lake Sélingué fishing groups are participating in the development of lake management plans that will ensure optimum sustainable production.

Success Stories



Fish farmer Seydou Toé: Mr. Toé is farmer who had previously tried fish farming but experienced problems due to insufficient technical information on pond construction and management. Following participation in project pond culture training events, he has greatly improved his own fish farming efforts, by renovating old ponds, building new ponds, and producing catfish fingerlings for sale. He is also now training other farmers.



Rice farmer Mamadou Samake: Mr. Samake is a rice producer in the Baguineda irrigation area east of Bamako. In June 2009, he volunteered to participate in the project's rice-fish demonstrations by modifying his rice field and stocking it with fish. His field was stocked in July and by November, more than 106 kg of fish were harvested, generating additional income for Mr. Samake. His experience also generated interest among other rice producers, many of whom now plan to go into rice-fish culture during their next production cycle.



Enhancements to existing training facilities: A new catfish hatchery setup was built and installed at the Sotuba Centre de Formation Pratique en Elevage by CRSP trainees returning from project-sponsored pond culture training in Kenya in April 2009. This facility was used in a subsequent training course for Malian farmers, and continues to be operated by the Association des Pisciculteurs et Aquaculteurs du Mali to produce catfish fry.



Formation of the Jigija ("Hope") Association: Following his participation in a CRSP pond culture training course in February 2009, Moussa Ballo returned home to form the Jigija ("Hope") Association. This 11-member group of fishers is now building ponds and growing fish together. The Jigija Association offered their first pond they constructed in on-farm trials organized by the CRSP pond culture component. The pond was stocked in July 2009 and is scheduled to be harvested in February 2010.



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VERS LE DÉVELOPPEMENT D'UN SYSTÈME DURABLE DE GESTION DES PÊCHES ET D'AQUACULTURE EN EAU DOUCE AU MALI : TRAVAUX DE COLLABORATION DANS LE CADRE DU PROJET AQUAFISH CRSP

James Bowman¹, Lisa Reifke¹, Héry Coulibaly², Charles Ngugi³, Yang Yi⁴, Liu Liping⁴, Nancy Gitonga⁵, Peter Nzungi⁶, et Hillary Egna¹

¹Oregon State University, Corvallis, Oregon USA, ²Direction Nationale de la Pêche, Mali, ³Moi University, Kenya, ⁴Shanghai Ocean University, Shanghai, China, ⁵FishAfrica, Nairobi, Kenya, ⁶Fisheries Department, Nairobi, Kenya



INTRODUCTION

En 2007, The Aquafish CRSP Collaborative Research Support Program (Aquafish CRSP) a commencé un partenariat avec la Direction Nationale de la Pêche (Mali) en collaboration avec les chercheurs de Moi University (Kenya), Shanghai Ocean University (China), et FishAfrica (Kenya). Ainsi, le *Projet du Mali* a été lancé dans le but de favoriser un développement durable de l'aquaculture et des pêches au Mali. Le projet est conduit sous l'appui de la Mission au Mali de l'Agence des Etats-Unis pour le Développement International (USAID) à travers un accord de coopération avec l'Université de l'Etat d'Oregon (Oregon State University).

Les travaux du Projet du Mali sont basés sur des thèmes variés couvrant trois secteurs principaux: la Pisciculture en Étangs, la Rizipisciculture, et la Planification des Pêches. Les thèmes de l'Aquaculture visent à d'identifier les stratégies appropriées pour la pisciculture en étangs et la rizipisciculture, et à développer des méthodes de vulgarisation permettant la dissémination et la mise en pratique de ces stratégies par les fermiers des zones identifiées par le Projet. Quant au secteur halieutique, le projet veut évaluer la situation actuelle des pêcheries du Lac Sélingué, identifier les problèmes de gestion des pêches, et faire participer les parties prenantes locales dans les processus de planification requis pour une gestion adéquate de leurs pêcheries.



PISCICULTURE EN ÉTANGS



Les objectifs de la pisciculture en étang sont accomplis en fournissant une formation pratique dans la construction des étangs, la reproduction artificielle des poissons, et la gestion des étangs, et en conduisant des essais pratiques sur le terrain afin d'identifier les meilleures méthodes de pisciculture en étangs applicables au Mali. Résumé des activités accomplies:

- SESSION DE TRAVAIL SUR LA PISCICULTURE EN ÉTANGS AU MALI - Février 2009, Bamako, Mali: 24 stagiaires
- SESSION DE FORMATION SUR LA REPRODUCTION ARTIFICIELLE ET GESTION DE L'ÉCLOSERIE DU POISSON-CHAT - Avril 2009, Sagana, Kenya: 4 stagiaires
- SESSION DE FORMATION SUR LA REPRODUCTION ARTIFICIELLE ET GESTION DE L'ÉCLOSERIE DU POISSON-CHAT - Juillet 2009, Bamako, Mali: 22 stagiaires
- TRAVAUX PRÉLIMINAIRES DE PRÉPARATION DES ESSAIS SUR LE TERRAIN - Juin 2009, Bamako, Mali: 20 stagiaires
- INSTALLATION ET CONDUITE DES ESSAIS SUR LE TERRAIN - Juillet 2009 - Janvier 2010: plusieurs sites au Mali

RIZIPISCICULTURE

Sous ce thème, le Projet fournit la formation nécessaire et conduit des essais sur le terrain, et évalue les techniques rizipiscicoles applicables aux zones irriguées longeant le fleuve Niger au Mali. Résumé des activités accomplies:

- COURS DE FORMATION EN RIZIPISCICULTURE - Septembre 2008, Shanghai Ocean University, Chine: 2 stagiaires maliens
- SESSION DE TRAVAIL SUR LES METHODES MODERNES DE RIZIPISCICULTURE - Juin 2009, Bamako, Mali: 21 stagiaires
- INSTALLATION ET EXECUTION DES DEMONSTRATIONS RIZIPISCICOLES - Juillet-Novembre 2009, Zones irriguées de Baguineda: 4 fermiers
- SESSION DE TRAVAIL SUR LES TECHNIQUES AQUACOLES APPROPRIÉES APRES-RECOLTE - Novembre 2009, Baguineda: 22 stagiaires
- SESSION DE TRAVAIL SUR LA FORMATION ET DÉVELOPPEMENT DES CAPACITÉS DE VULGARISATION DE LA RIZIPISCICULTURE - Novembre 2009, Mali: 27 stagiaires



AMÉNAGEMENT DES PÊCHERIES

Le but de ce thème est d'assister le Gouvernement du Mali dans la conduite des enquêtes cadres et de faire participer les pêcheurs locaux dans le développement des accords communs de gestion adéquate des pêcheries, en commençant par celles de la région du Lac Sélingué. Résumé des activités accomplies:

- FORMATION DES SURVEILLANTS POUR LES ENQUÊTES CADRES - Février 2009, Lac Sélingué: 11 stagiaires
- FORMATION DES AGENTS RECENSEURS POUR LES ENQUÊTES CADRES - Février 2009, Lac Sélingué: 20 stagiaires
- ENQUÊTE CADRE SUR LE LAC SÉLINGUÉ- Février, 2009
- ANALYSE DES DONNÉES DE L'ENQUÊTE CADRE - L'analyse a été terminée et un rapport complet a été soumis au Gouvernement du Mali en Juin 2009.

Des sessions de travail avec les parties prenantes pour discuter les résultats de l'enquête, évaluer diverses options pour la gestion du lac, et commencer le processus de aménagement des Pêcheries seront prévue pour Mars 2010.



Cas Exemplaires de Succès

Seydou Toé, Pisciculteur: Mr. Toé est un fermier qui avait auparavant essayé la pisciculture mais sans beaucoup de succès à cause d'un manque d'informations techniques suffisantes sur les méthodes de construction et de gestion des étangs. Après avoir participé aux sessions de formation sur la pisciculture offertes par ce projet, il a considérablement amélioré ses propres installations et pratiques en rénovant de vieux étangs, en construisant de nouveaux étangs, et en produisant des alevins de poisson-chat pour la vente. Il a été promu formateur d'autres fermiers.



Mamadou Samake, Rizipisculteur: Mr. Samake est un producteur de riz dans la zone irriguée de Baguineda située à l'Est de Bamako. En Juin 2009, il s'est porté volontaire pour participer aux démonstrations rizipiscicoles du projet et a ainsi modifié son champ de riz afin d'y élever également des poissons. Le champ a été mis en charge en Juillet et, déjà en Novembre, plus de 106 kilogrammes de poissons ont été récoltés, produisant ainsi un revenu supplémentaire pour Mr. Samake. Son expérience a également motivé d'autres producteurs de riz qui envisagent pratiquer la rizipisciculture dès le début du prochain cycle de production.



Formation de l'Association Jigija ("Espoir"): Par suite de sa participation à un cours de formation en pisciculture en étang offert par le Projet CRSP en Février 2009, Moussa Ballo a décidé de former l'Association Jigija ("Espoir") des son retour à la maison. Ce groupe de 11 pêcheurs construit maintenant des étangs et pratique l'élevage de poissons sous forme de coopérative. L'Association Jigija a offert au CRSP le premier étang qu'ils ont construit pour conduire les essais sur terrain. L'étang a été mis en charge en Juillet 2009 et la récolte de poissons est prévue en Février 2010.

Perfectionnements des centres de formation existants: Une nouvelle écloserie du poisson-chat a été construite au Centre de Formation Pratique en Élevage de Sotuba par des stagiaires du CRSP retournant d'une formation en pisciculture financée par ce projet au Kenya en Avril 2009. Cette infrastructure a été utilisée ultérieurement pour les cours de formation des fermiers Maliens, et l'Association des Pisciculteurs et Aquaculteurs du Mali continue l'utilisation de l'écloserie pour la production des alevins de poisson-chat.



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PARTNERS

Direction Nationale de la Pêche (Government of Mali)
Moi University (Eldoret, Kenya)
Shanghai Ocean University (Shanghai, China)
FishAfrica (Nairobi, Kenya)
Oregon State University (Corvallis, Oregon, USA)



PROJECT LEADERS

Dr. Héry Coulibaly, Direction Nationale de la Pêche,
Ministry of Livestock and Fisheries Development
(MLFD), Mali
Dr. Charles Ngugi, Moi University, Kenya
Dr. Liu Liping, China
Ms. Nancy Gitonga, Kenya
Dr. James Bowman, Oregon, USA
Dr. Hillary Egna, Oregon, USA



The AquaFish CRSP Mali project involves various stakeholders in the Mali aquaculture industry as beneficiaries, including farmers, fishers, fishing communities, extension and technical personnel, and members of local NGOs. Novice and prospective fish farmers will learn current, practicable techniques for the culture of tilapia and catfish in Mali. Rice producers will discover and apply techniques for producing crops of fish along with their rice crops. Members of Lake Sélingué fishing groups will participate in the development of a lake management plan that will ensure optimal and sustainable production.

AQUATIC RESOURCE USE AND CONSERVATION FOR SUSTAINABLE FRESHWATER AQUACULTURE AND FISHERIES IN MALI



Aquaculture & Fisheries
Collaborative Research Support Program
Oregon State University
College of Agricultural Sciences
418 Snell Hall, Corvallis, OR 97331 USA

Tel: 1-541-737-6426 | Email: aquafishcrsp@oregonstate.edu
Web: aquafishcrsp.oregonstate.edu



MALI PROJECT GOALS & OBJECTIVES

The goal of the project is to improve the productivity and income of producers in Mali by facilitating access to technologies and building capacity of stakeholders involved in freshwater fish farming and capture fisheries management.

GENERAL OBJECTIVES

- Facilitate access and adoption of improved aquaculture production technologies in targeted areas to increase and diversify the incomes of farmers
- Enhance the capacity of the GOM to develop and disseminate relevant technologies
- Identify appropriate strategies for implementing integrated rice-fish farming in target areas
- Help develop an appropriate fisheries management plan to ensure long-term viability and sustainability of capture fisheries in the target area
- Assist in establishing linkages for further development of aquaculture and fisheries in Mali

TAKING A SOUTH-SOUTH APPROACH TOWARDS COLLABORATION ACROSS THREE THEMES:



THEME I: POND CULTURE

ADVANCING SUSTAINABLE FRESHWATER AQUACULTURE PRACTICES AND TECHNOLOGIES

OUTPUTS:

- POND CULTURE WORKSHOP IN MALI: February 2009 in Bamako, led by Charles Ngugi with 24 trainees, including 5 from the Regional Fisheries Directorates in Bamako and Koulikoro
- CATFISH PROPAGATION/HATCHERY MANAGEMENT I: April 2009 in Kenya at the Sagana Aquaculture Center with four Malians traveling to Sagana
- CATFISH PROPAGATION/HATCHERY MANAGEMENT II: July 2009 led by James Mugo and Charles Ngugi at the Centre de Formation Pratique en Elevage in Bamako, Mali with 22 participants
- PRELIMINARY ON-FARM TRIALS WORKSHOP: June 2009 in Bamako, Mali with 20 participants
- SETUP AND RUNNING OF ON-FARM TRIALS: July 2009-January 2010

TOPICS COVERED:

- Aquaculture planning
- Site selection
- Fish species selection
- Hatchery management
- Farming economics and management
- Catfish management and propagation



THEME II: RICE-FISH

PROMOTING SUSTAINABLE RICE-FISH AQUACULTURE IN IRRIGATED SYSTEMS

OUTPUTS:

- TRAINING COURSE ON RICE-FISH CULTURE: September 2008 at the Shanghai Ocean University in China with two Malians
- WORKSHOP ON UP-TO-DATE TECHNIQUES FOR RICE FISH CULTURE IN CHINA: June 2009 in Bamako, Mali where two CRSP-trained Malians presented techniques on rice-fish culture to 21 participants
- WORKSHOP ON APPROPRIATE AQUACULTURE POST-HARVEST TECHNIQUES: November 2009, Mali
- WORKSHOP ON TRAINING AND EXTENSION CAPACITY BUILDING: November 2009, 27 participants



THEME III: FISHERIES PLANNING

BUILDING COMMUNITY AND CONSENSUS TOWARDS A FISHERIES MANAGEMENT PLAN

OUTPUTS:

- FRAME SURVEY TRAINING FOR SUPERVISORS: February 2009, Lake Sélingué, 11 participants
- FRAME SURVEY TRAINING FOR ENUMERATORS: February 2009, Lake Sélingué
- FRAME SURVEY OF LAKE SÉLINGUÉ: February 2009
- ANALYSIS OF FRAME SURVEY DATA: June 2009

PARTENAIRES

Direction Nationale de la Pêche
(Gouvernement du Mali)
Moi University (Eldoret, Kenya)
Shanghai Ocean University (Shanghai, China)
FishAfrica (Nairobi, Kenya)



CHEFS DE PROJET

Dr. Héry Coulibaly, Direction Nationale de la Pêche,
Ministry of Livestock and Fisheries Development
(MLFD), Mali
Dr. Charles Ngugi, Moi University, Kenya
Dr. Liu Liping, China
Ms. Nancy Gitonga, Kenya
Dr. James Bowman, Oregon, USA
Dr. Hillary Egna, Oregon, USA



Diverses parties prenantes de l'industrie aquacole du Mali participent et bénéficient des activités du Projet AquaFish CRSP au Mali. Ces parties prenantes comprennent les fermiers, les pêcheurs et leurs communautés, les membres des ONG, ainsi que le personnel technique et de vulgarisation. Les nouveaux pisciculteurs et les fermiers éventuellement intéressés à la pisciculture apprennent des techniques modernes faisables de culture du tilapia et du poisson-chat au Mali. Les producteurs de riz seront capables de découvrir et appliquer les techniques de production des poissons en plus de leurs récoltes de riz. Les membres des groupes de pêche du Lac Sélingué pourront activement participer dans le développement des plans de gestion du lac qui assureront une production optimale durable.

UTILISATION ET CONSERVATION DES RESSOURCES AQUATIQUES POUR UN SYSTÈME DURABLE DE PÊCHE ET D'AQUACULTURE EN EAU DOUCE AU MALI



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BUTS ET OBJECTIFS DU PROJET DU MALI

Le but du projet est d'améliorer la productivité et le revenu des producteurs au Mali en leur facilitant l'accès aux technologies et en développant la capacité des parties prenantes actives dans la pisciculture en eau douce et dans la gestion des pêches de capture..

OBJECTIFS GÉNÉRAUX

- Faciliter l'accès et l'adoption des technologies améliorées de production aquacole dans les zones du projet afin d'augmenter et de diversifier les revenus des fermiers
- Améliorer la capacité du gouvernement Malien en ce qui concerne le développement et la vulgarisation de technologies adéquates
- Identifier les stratégies appropriées pour la mise en place de la rizipisciculture dans les zones du projet
- Faciliter le développement d'un bon plan de gestion des pêches afin d'assurer la viabilité et la durabilité à long terme des pêches de capture dans les zones spécifiques
- Aider dans la mise en place de liens interinstitutionnels nécessaires au développement futur des pêches et de l'aquaculture au Mali

ADOPTION D'UNE APPROCHE SUD-SUD DE COLLABORATION À TRAVERS TROIS THÈMES:



THÈME I: PISCICULTURE EN ETANGS

PROMOTION DES MÉTHODES ET TECHNIQUES DURABLES D'AQUACULTURE EN EAU DOUCE

REALISATIONS:

- SESSION DE TRAVAIL SUR LA PISCICULTURE EN ETANGS AU MALI - Février 2009, Bamako, formation de 24 stagiaires (dont 5 venaient de la Direction Régionale des Pêches à Bamako et Koulikoro) par Charles Ngugi
- REPRODUCTION ARTIFICIELLE ET GESTION DE L'ECLOSERIE DU POISSON-CHAT I: Avril 2009 au Centre Aquacole de Sagana au Kenya, avec 4 stagiaires venant du Mali
- REPRODUCTION ARTIFICIELLE ET GESTION DE L'ECLOSERIE DU POISSON-CHAT II : Juillet 2009, conduit par James Mugo et Charles Ngugi au Centre de Formation Pratique en Elevage de Bamako, Mali. 22 participants
- TRAVAUX PRÉLIMINAIRES DE PRÉPARATION DES ESSAIS SUR LE TERRAIN: Juin 2009 à Bamako, Mali. 20 participants
- INSTALLATION ET CINDUITE DES ESSAIS SUR LE TERRAIN: Juillet 2009 - Janvier 2010

MATIÈRES D'ETUDE:

- Planification de l'aquaculture
- Sélection du site
- Choix des espèces de poissons
- Gestion d'une éclosérie
- Gestion et économie agricoles
- Gestion et propagation du poisson-chat



THÈME II: RIZIPISCICULTURE

PROMOTION D'UN SYSTEME DURABLE DE RIZIPISCICULTURE DANS LES ZONES IRRIGUÉES

REALISATIONS:

- COURS DE FORMATION EN RIZIPISCICULTURE: Septembre 2008 à Shanghai Ocean University, Chine. 2 stagiaires Maliens
- SESSION DE TRAVAIL SUR LES METHODES MODERNES DE RIZIPISCICULTURE EN CHINE: Juin 2009 à Bamako, Mali. Deux Maliens formés par le CRSP ont présentés les techniques rizipiscicoles à 21 participants
- SESSION DE TRAVAIL SUR LES TECHNIQUES AQUACOLES APPROPRIÉES APRES-RECOLTE: Novembre 2009 au Mali
- SESSION DE TRAVAIL SUR LA FORMATION ET DÉVELOPPEMENT DES CAPACITÉS DE VULGARISATION: Novembre 2009, 27 participants



THÈME III: AMÉNAGEMENT DES PÊCHERIES

DÉVELOPPER UN SENS DE COMMUNAUTÉ ET DE CONSENSUS DANS LE CADRE D'UN PLAN DE GESTION DES PÊCHES

REALISATIONS:

- FORMATION DES SURVEILLANTS DES ENQUÊTES CADRES: Février 2009, Lac Sélingué, 11 participants
- FORMATION DES AGENTS RECENSEURS DES ENQUÊTES CADRES: Février 2009, Lac Sélingué, 20 stagiaires
- ENQUÊTE CADRE SUR LE LAC SÉLINGUÉ: Février 2009
- ANALYSE DES DONNÉES DE L'ENQUÊTE CADRE: Juin 2009

The Mali Project works within the framework of three thematic areas: Pond Culture, Rice-Fish Culture, and Fisheries Planning. For the aquaculture themes, the project seeks to identify appropriate strategies for pond aquaculture and rice-fish culture and to make those strategies available for implementation by farmers in selected areas. For the fisheries sector, it seeks to evaluate the present status of the Lake Sélingué fishery and involve local stakeholders in the planning processes necessary for sustainable management of their fishery. During 2008 and 2009, a variety of activities were conducted under the Project's three thematic areas.



POND CULTURE:

- Conducted a short-course on pond construction and management in Bamako (24 trainees)
- Trained 4 Malians in catfish propagation techniques at Sagana Aquaculture Centre in Kenya
- Conducted a short-course on catfish propagation techniques in Bamako (22 trainees)
- Conducted on-farm research trials in the Bamako area to evaluate alternative pond culture strategies (20 trainees)
- Started academic training of 1 BS degree student



RICE-FISH CULTURE:

- Adapted rice-fish technologies from China to Mali (2 trainees)
- Set up and ran rice-fish demonstration plots in the Baguineda irrigation area (21 trainees)
- Held a post-demonstration workshop to discuss the outcomes of the research demonstration plots
- Conducted a workshop on appropriate aquaculture post-harvest technologies for Mali
- Started academic training of 2 BS degree students



FISHERIES PLANNING:

- Developed and adapted fisheries management technologies from Kenya to Mali (31 trainees)
- Conducted and analyzed a frame survey of Lake Sélingué
- Stakeholders' workshops are planned to discuss findings of the Sélingué frame survey and consider lake management options



December 2009