

## **Expansion of Tilapia and Indigenous Fish Aquaculture in Guyana: Opportunities for Women**

Sustainable Feed Technology/Study/09SFT03UA

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### **ABSTRACT**

The focus of this investigation was an effort to work with fish farmers in two regions of Guyana to develop sustainable aquaculture systems. In the coastal region we worked with the Trafalgar Union women's cooperative and some individual farmers. Their primary focus was on tilapia and hassar. The hassar is a native species of armored catfish that is considered a delicacy in Guyana and Trinidad and Tobago. Tilapia were introduced to Guyana many years ago for mosquito control but have now become a popular food fish. In recent years, genetically male tilapia have been imported from Great Britain to upgrade the broodstocks available. We collaborated with the Guyana Department of Agriculture on the distribution and maintenance of these broodstocks to a regional hatchery.

In the interior region, we have been working with the Bina Hill Association which is composed primarily of women representatives for several of the surrounding villages. Our primary focus was on working with these women and the rest of the community to develop and demonstrate an integrated aquaculture-agriculture system that would be stocked with native fish species. With no electrical grid available, we determined it would be better to run from solar panels and batteries, rather than the very expensive diesel which must be trucked in. The first solar panel and battery array was purchased and delivered to the demonstration. The fish are scheduled to be delivered in late September 2011, assuming the rainy season has ended and the road is passable.

Over all we conducted three workshops for the women of Trafalgar Union and one farm visit. We held three workshops for the Bina Hill community in Annai and have prepared the plans for the demonstration and provided some of the materials. We have also provided some of the aquaculture supplies for both projects.

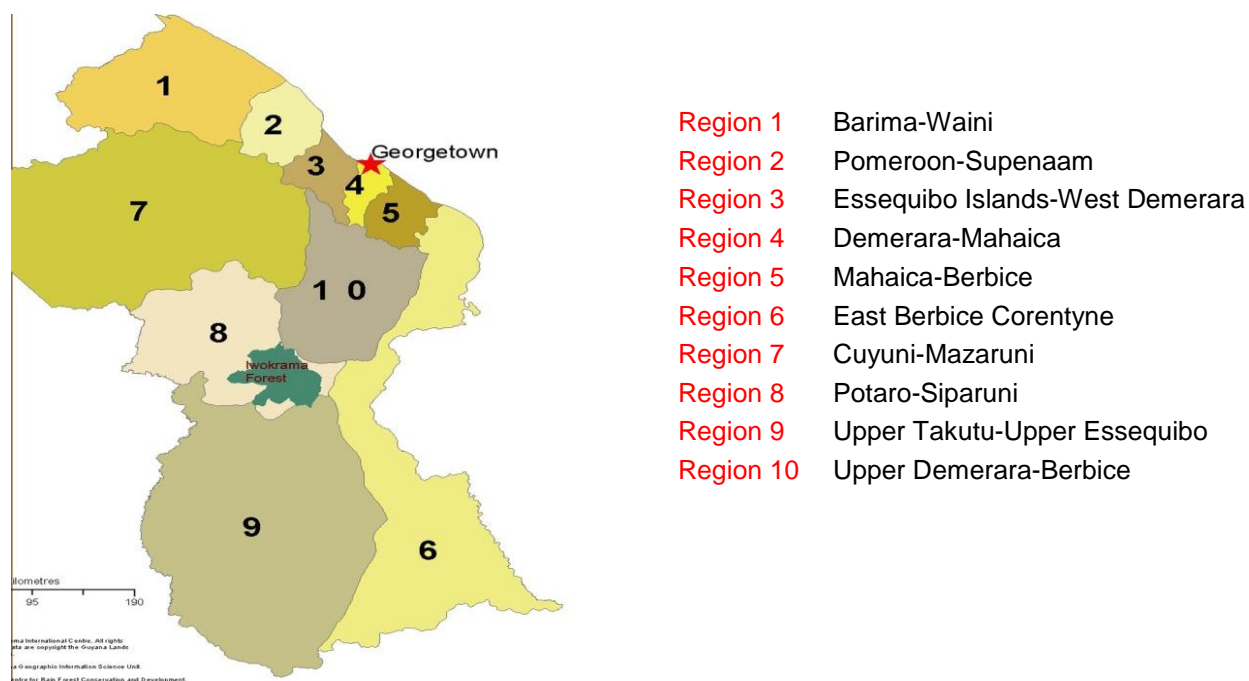
### **OBJECTIVES**

- a. To support development of small scale aquaculture in poor rural areas, with a focus on women's groups in Trafalgar Union and Annai
- b. To support development of a regional hatchery program utilizing YY Genetically Male donated by DFID
- c. To identify and determine indigenous fishes with aquaculture potential
- d. Finalize development of a standard aquaculture feed containing locally available ingredients.

## INTRODUCTION

Guyana, in South America, has some of the best protected rainforests in the world as well as enormous quantities of pristine freshwaters, little industry, a relatively small population and a long coastline. There is tremendous potential for small and large scale aquaculture in freshwaters, brackish water and in marine systems. The northern watersheds drain to the Caribbean while its southern watersheds are part of the Amazon Basin. Our AquaFish CRSP work in Guyana is split between the two areas. The northern watersheds drain to the coastal areas to the east and west of the capital Georgetown. The road to the west does not extend very far into Region 3, but the east road extends all the way to the border with Surinam. In this eastern area, Regions 4 and 5, we have worked with a number of individual farmers rearing tilapia and pacu and with one women’s cooperative rearing tilapia and hassar, a local armored catfish. The farms are all arrayed along the coastal highway and use their fish primarily for direct consumption and local sales, as well as some sales to the major population center of Georgetown.

### ADMINISTRATIVE REGIONS OF GUYANA



## RESULTS

In Regions 4 and 5 we have worked with most of the individual farmers including those growing tilapia, pacu and shrimp, a feed mill producing fish feed and one tilapia hatchery. The tilapia farmers are using both Mozambique tilapia imported years ago and improved selections of Nile tilapia donated by Swansea University in Wales with support from the British DFID. The YY genetically male tilapia were first brought to the Mon Repos Station managed by Pamela Ramotar with the Fisheries Office. Later some of the broodstock were transferred to Mr. Chico Persaud, operator of the Maharaja Mill. Chico was the manufacturer of the local aquaculture diets and our collaborator on feed formulations and trials. We helped to design a tilapia hatchery adjacent to his feed mill. Unfortunately after all of our work with Mr. Persaud, he emigrated to Canada in late 2010. He has left the Mill and hatchery in hands of a brother who has no background in the business and has assigned a caretaker to the operation. We have spent some time to educate the caretaker, but so far with slow progress.



*Tilapia hatchery at Maharaja Mill*

Due to the departure of Mr. Persaud, our feed development aspect, and trials, was hindered. The eventual decision was to have Ms. Ramotar continue the feeding trials as part of her Master’s project here at the University of Arizona. The trials are underway at the time of this writing.

Lacking access to the Maharaja Mill, we did develop a small project with Mr. Benni Sankar to develop simple on farm diet with local ingredients. Mr Sankar purchased a small hammer mill grinder and a basic pellet mill. Both pieces of equipment were manufactured in China and came without any instructions. We spent several days working with Mr. Sankar at his farm in Region 3. His basic ingredients were to be fish meal derived from the carcasses of filleted marine catfish, rice bran and broken rice from the rice farm operation and vegetable oil. We spent considerable time getting the equipment operating, training staff, and formulating a mix that would go through the equipment without plugging dies and screws. We eventually came up with a workable formulation. But the stability of the pellet in water was very short, less than one minute.



*Simple hammer mill for grinding fish carcasses*



*Pellet mill*

We have more expansive hopes for the additional farmers in Region 4 and 5 and have started test shipments of tilapia to Florida. The first shipment was stalled and ruined by airline employees who thought that we were missing a permit. The second shipment was successful with high quality fish shipped to and sold by Sammy's Seafood, a seafood company in St. Petersburg, FL . We have also assisted the two shrimp farmers who use extensive methods of non-fed, tidal impoundments. On our last visit we collected shrimp samples for return to Arizona for species identification and gross health exam. We have suggested that they consider tilapia in cages in their ponds to increase revenues, increase growth and survival of the shrimp and diversify their sales (in time and product).



*Pamila Ramotar with farmed pacu*



*Preserving shrimp samples*

The Trafalgar Union Women's Cooperative is one of the largest farms in Region 5. This cooperative of 16 women have pooled their resources and been provided with a low cost lease on 12.5 hectares of federal land. The farm now includes 10 ponds and four more under construction. We have conducted three workshops for the women. One at the national aquaculture center at Mon Repos, one at the Maharaja Feed Mill and a third at the Trafalgar Union Farm. The first workshop, 15 August 2008, included basics of aquaculture and tilapia biology. The group met early in the morning and we started with introductions and welcoming comments. We spent the rest of the morning covering aquaculture production systems and marketing. We had a lunch provided for everyone and then started an afternoon session focused on tilapia and the two strains, YY Nile tilapia and red tilapia that are currently being farmed. Later in the afternoon we toured the Mon Repos facility and then reconvened at the Maharaja Oil Mill. We discussed some basics of feed manufacturing and feed handling. The second workshop, 18 June 2009, was held at the Mon Repos station and also moved later to the Maharaja Mill and covered basic fish nutrition, feed formulations, feed manufacturing, and on farm feed handling and distribution. The third workshop was held at the Trafalgar Union farm on 20 June 2011. This workshop was conducted on the farm moving from site to site. We started at the pumping station for introductions and to review water supplies and biosecurity. We then all moved to the ponds to discuss feeding practices, predator control, weed and algae control, taste and odor issues and harvest practices. Finally we moved back to the office and working area to discuss harvest and quality control aspects. We also discussed the sales and marketing aspects and plans for international distribution (to Florida and Trinidad).





*Office and feed storage at The Trafalgar Union Model Farm. Coop leader Ms. Shenella Lewis and several of the sons and nephews who have been hired to work at the farm.*

Our second area of interest is in the Rupununi Basin in the southern portion of Guyana. The Rupununi is a part of the Amazon watershed that seasonally floods large areas of savanna. The indigenous populations of the Rupununi are commonly referred to as AmerIndians. These native people have a very different culture and lifestyle compared to the coastal populations, which are composed of the descendants of black slaves and East Indian indentured workers. There is only one unpaved road across the Rupununi Basin and no electrical or phone systems. The people are essentially subsistence farmers utilizing solar panels or diesel generators for household electrical power. As there are no phone, radio or television signals, Internet connections through satellite dish is the only communication with the outside, besides irregular mail service when the dirt road is passable.

Our focus in the southern watersheds was to develop, describe and demonstrate a simple integrated farming system utilizing native fishes and vegetable crops grown in the area. We organized our workshops and visits with the Fisheries Office staff in Georgetown before flying by small plane to the airstrip at Annai. We held our first workshops in August 2010 to describe the system to the community members and to gather their input and suggestions as to how to improve the concept. We also visited several ponds that had previously been built in the area. None of the ponds could be drained. None were fenced to keep out caiman or other fish eaters. Several of the ponds were more than three meters deep. The attempts at stocking had failed. And any attempts to harvest by net were sure to fail.

Therefore we recommended a simple small pond system coupled with production of local vegetables. We also spent considerable time discussing the native fishes that could be farmed and how best to feed them in a farm setting. The species of greatest interest were: pacu (*Colossoma*), cascadura (*Hassar*), and arapaima (*Arapaima gigas*). All three are heavily overfished in the area and are considered delicacies of high monetary value. The pacu and especially arapaima are considered excellent sport fish that support valuable tourism. After the workshop we conducted a literature review to examine other species and to gather culture information on the pacu, hassar and arapaima.



*Poorly constructed pond*



*Community pond used for fishing*

A second workshop was led by our host country PI, Pamila Ramotar on 21 September, 2010 and a third on 12 November 2010. She presented additional information of culture of pacu and arapaima with handouts and contacts to Brazilian farms and hatcheries.

With the lack of reliable electricity we incorporated a solar panel for the pump to be used during irrigation periods during our fourth workshop on the 15<sup>th</sup> and 16<sup>th</sup> of June 2011. For the demonstration pond and garden, a panel was purchased in Georgetown along with a battery, a controller and a direct current pump. We took the materials as our checked baggage and flew to Annai with change of clothes in hand.

After the prior workshop and discussions with the local association of farmers, we determined to put the demonstration farm at the Rock View Lodge. The Lodge is situated between the airstrip and the dirt highway crossing the Rupununi. The regional primary and secondary schools are on either side of the Lodge and virtually all the school children cross the property twice a day going or returning from school. With the open and sharing nature of the society, it is normal for everyone to stop and see anything that is new when “passing by”. Everyone agreed this would be the best location. The proprietor, Colin Edwards, has started the pond construction and planted the garden. He has the solar panel and battery apparatus ready to install when the fish are stocked. The current plan is to stock with pacu fingerlings. The pacu are native to the area and fingerlings are available from a hatchery across the border in Brazil. Delivery is only possible in the dry season, but plans have been developed for stocking in November 2011.

During the fourth workshop, we also spent considerable time discussing within the community the pro’s and con’s of rearing tilapia versus the native fishes. While most of us would prefer to work with native fishes, one member of the community felt that tilapia would be a superior fish and insisted on his right to import and rear the fish. A considerable amount of time was spent on this issue. We think we finally convinced the farmer that natives were a preferred crop for now and that the introduction of tilapia into the region had too many potential environmental risks.



*Workshop in Annai, at the Bina Hill Community Center, August 2010.*

## CONCLUSIONS

The project has certainly succeeded in providing the training and support to assist two groups and several individuals to advance their aquaculture efforts and improve sales of farmed fish domestically and now on an international level. In addition to training we have provided some materials and supplies for their operations. We have worked closely with the Guyana Investment and Trade Service, a contractor working on US-AID grant to support development in Guyana. We have also coordinated with the Farmer to Farmer program who provided support for one of our graduate students to contribute with a volunteer mission to Guyana.

We expect to see continued growth of the aquaculture sector in Guyana with tilapia, hassar and shrimp along the coast and with pacu and arapaima in the interior. Our contributions to training, technical support, supplies and international marketing are showing results. We look forward to additional expansion in coming years. A significant weakness in the project has been the half-hearted support of the Department of Fisheries within the Ministry of Agriculture. At times, Fisheries staff assigned to work with us were not allowed to travel to international conferences, even with our full financial support, or even to accompany in the field within Guyana, again with our financial support. Some of the monies transferred to support specific activities within Guyana, have still not been spent. These funds are still in a suspense account that can be spent as soon as approved by the Minister, but repeated assurances that the approval was pending and the funds would be spent as promised have come and gone.