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Report of the

**CARICOM/CRFM/JICA Second Regional Workshop on  
Aquaculture Development Planning**



**Kingston, Jamaica  
29-31 August 2011**

CRFM Secretariat  
Belize  
2011

# **CRFM Technical & Advisory Document - Number 2011/4**

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### Report of the CARICOM/CRFM/JICA Second Regional Aquaculture Development Planning Workshop, 29 – 31 August 2011, Kingston, Jamaica

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## 1.0 Background

The aquaculture sector is not well developed in the CARICOM region, with significant development limited to countries like Jamaica and Belize. Other countries like Guyana, Suriname and Trinidad and Tobago have begun to put more emphasis on aquaculture as an area for development. The practices mainly involve the use of ponds to culture such species as penaeid shrimp (*Penaeus* spp.), tilapia, (*Oreochromis* spp.), carp (*Ctenopharyngodon idellus*, *Hypophthalmichthys nobilis*, *Hypophthalmichthys molitrix*) and cachama (*Colossoma macropomum*). Also, there is long line culture for algae (*Eucheuma* spp. and *Gracilaria* spp.) in St. Lucia and the mangrove oyster (*Crassostrea rhizophorae*) in Jamaica.

Most CARICOM States have limited land and fresh water resources, however some, like Belize, Guyana and Suriname, do have ample supplies. On the other hand, most states have larger expanses of marine space than land mass, which offers the potential for the promotion and development of mariculture. As such, the approach to aquaculture development will have to be multifaceted in its focus, design and implementation in order to address the needs of those with ample land and fresh water resources and those with less of these resource endowments. The CRFM has identified the promotion and development of aquaculture as one of the programme areas within its Strategic Plan (2002), Caribbean Regional Fisheries Mechanism First Medium Term Plan (2004-2007) and Caribbean Regional Fisheries Mechanism Second Medium Term Plan (2008 - 2011).

The CARICOM/CRFM/JICA Project: Study on Formulation of Master Plan on Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean has been developed with the aim to conduct a study and formulate a Master Plan on the Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean. It is being funded by JICA under the CARICOM/Japan Cooperation Agreement and is addressing the following components: (i) pelagic resource development and management; (ii) aquaculture development policy formulation; (iii) regional fisheries database development; (iv) support for community-based management; and (iv) education and training in the component fields in the CARICOM States. The expected outputs are: (i) a Master Plan on Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean; (ii) reports of Baseline and Pilot Studies conducted under the various components; and (iii) transfer of relevant technology to the institutions and staff of CRFM Member States and CRFM Secretariat during the course of the Study.

Following on the First Project Steering Committee Meeting in December 2009, and subsequent communication among the CRFM and JICA/IC Net Ltd, three (3) pilot projects were selected for implementation in 6 countries between April 2010 and October 2011. The Pilot Projects and countries where they are being implemented are: (i) Fish Aggregating Device (FAD) and Associated Pelagic Fisheries Resources Development and Management (Dominica and St. Lucia); (ii) Development of Fisheries Statistical System Models (Guyana and St. Vincent and the Grenadines); and (iii) Small-scale aquaculture training (Jamaica) and low cost small-scale aquaculture development (Belize).

In relation to the Small-scale Aquaculture Training, two regional workshops are scheduled during the period of pilot project implementation; the first in March 2011 and the second in August 2011, with the inter-sessional period to be used by participants to review and finalize, in consultation with the relevant stakeholders, the draft action plans for sustainable aquaculture development for the respective Member States.

This is the report of the *Second Regional Workshop on Aquaculture Development Planning*, held in Jamaica from 29 to 31 August 2011. The objectives of the second workshop were to receive and review (i) the progress reports which set out the steps taken, including any difficulties encountered, to develop the revised Draft Aquaculture Development Action Plans (ii) the Revised Draft Aquaculture Development Action Plans (including the project design matrices (PDM) and plans of operation (PO)) which would have been modified and refined by consultations and discussion with stakeholders in the respective countries; and (iii) the progress report and results of pilot projects on aquaculture development in Belize (testing of different feeds for selected species in extensive aquaculture) and Jamaica (training and extension with small-scale fish culture farmers).

## **2.0 Opening Ceremony**

The Workshop commenced with a brief Opening Ceremony, which was chaired by the Director, Aquaculture Branch, Jamaica Fisheries Division, Ms. Avery Smikle. The gathering heard addresses from the Ambassador of Japan in Jamaica, His Excellency Mr. Hiroshi Yamaguchi and the Minister of Agriculture and Fisheries, Jamaica, Hon. Robert Montague, who delivered the feature address. Remarks were also made by Lft. Cdr. Richard Russell, Chief Executive Officer, Jamaica Fisheries Division; Mr. Terrence Phillips, Programme Manager, Fisheries Management and Development, CRFM Secretariat; and Mr. Kazuo Udagawa, Deputy Team Leader, JICA Study Team.

## **3.0 Workshop Arrangements**

The participants, drawn from the CRFM Member States of Belize, Guyana, Haiti, Jamaica, and Suriname, reviewed and adopted the Workshop Agenda. The representative from Trinidad and Tobago was unable to attend the Workshop, but submitted their progress reports to the Workshop. The full List of Participants is given at **Appendix 1** and the Agenda appears at **Appendix 2**.

## **4.0 Country Progress Reports**

At the First Regional Aquaculture Development Planning Workshop held in March 2011, participants commenced the preparation of draft action plans for sustainable aquaculture development for their respective countries, with the understanding that the inter-sessional period would be used to review and finalize, in consultation with the relevant stakeholders, these draft plans. Each Member State was expected to prepare and present a progress report which should include a brief description of the inter-sessional activities undertaken; problems and constraints to the development of the draft action plan and necessary actions/measures taken to overcome the constraints, if any; and an overview of the revised draft aquaculture development action plan, Project Design Matrix and Plan of Operations. Summaries of the progress reports are given below. The Country Progress Reports, including the draft Aquaculture Development Plans, Project Design Matrix and Plan of Operations for each Member State where submitted, are provided at **Appendix 3**.

## 4.1 Belize

### 4.1.1 Summary

During the inter-sessional period, the aquaculture section of the Belize Fisheries Department carried out two activities aimed at improving and continuing the efforts that were initiated at the First Regional Aquaculture Workshop.

The first of these activities was the preparation for and delivery of a two-day training workshop on Project Cycle Management for the head office staff of the Belize Fisheries Department. The objective of the training workshop was to share the knowledge gained at the Regional Workshop on the Project Cycle Management tool with technical staff and allow them to use it to analyze the sectors of the fisheries industry in which they operate.

The second activity carried out was to present the outline of the draft aquaculture action plan prepared in Jamaica to stakeholders in Belize. Since, this project proposal focused on the implementation of a training workshop on tilapia farming for potential credit providers, it was necessary to obtain the reaction of these institutions to this type of project. The general reaction of commercial banks and credit unions in the country was that little, if any, work had been done between lending institutions and small scale fish farmers. Few loans had been made for projects related to small scale tilapia farming. They expressed interest in participating in training workshops related to tilapia farming and indicated that they would like to be provided with copies of the project proposal when completed. It is hoped that this activity would make it easier for small scale fish farmers to present their respective proposals to the banks and credit unions and obtain the necessary financing to launch or expand their tilapia operations.



*Mr. Miguel Sosa presenting Belize Progress Report*

#### **4.1.2 Discussion**

The following emerged from the discussions:

- The demand for tilapia was growing as the prices tended to be competitive when compared to other available fish and meats.
- There was growing market access to Mexico for fish and fish products with competitive pricing arrangements.
- Credit union interest rates tend to be lower and they often give preference to small scale projects.
- In promoting the development of cooperatives, they should be encouraged to chart their own direction based on their needs assessment.
- In promoting aquaculture development, it may be opportune to encourage all stakeholders to take an ecosystem based approach.

### **4.2 Guyana**

#### **4.2.1 Summary**

Compilation of the Project Design Matrix and the Draft Aquaculture Development Action Plan was completed in the inter-sessional period. The draft aquaculture development plan, which focuses on six areas each of which is expected to be implemented over a 5 year period, was circulated to stakeholders, but feedback was very limited and as such, the Action Plan was not revised as thoroughly as the Fisheries Department would have liked. The six areas of focus are (i) aquaculture policy and zoning; (ii) development of capacity in the aquaculture sector and research on feed formulation; (iii) farm and risk management; (iv) marketing; (v) communication/awareness building; and (vi) quality assurance and safety. Department personnel also reviewed the aquaculture network concept paper.

#### **4.2.2 Discussion**

Based on the discussions, participants noted the following:

- To finalise the plans, the Fisheries Department should utilize different methods (e.g. field visits; workshops) to better engage the stakeholders.
- In most cases, the requirements for small scale aquaculture tend to be different from those of commercial aquaculture, so the approaches to promoting development in the aquaculture sub-sector should be scaled accordingly.
- Commercial aquaculture was growing rapidly while small scale aquaculture was in its initial developmental stage.

### **4.3 Haiti**

#### **4.3.1 Summary**

Following on the First Regional Aquaculture Development Planning Workshop, contact was made with the Concertation, which is a national group of fisheries cooperatives, exporters, fish farmers and others interested in the fisheries and aquaculture sector, to discuss joint implementation of the Draft Aquaculture Development Action Plan. A one-day meeting was held with all stakeholders to inform them about the PDM and obtain their agreement for its implementation.

The Department of Fisheries and Aquaculture in collaboration with Cuban technicians are working to identify all existing and potential aquaculture facilities/sites in the country and to prepare a national zoning scheme. Four new aquaculture activities have been initiated, namely, the stocking of lakes in the south-east, the development of a tilapia hatchery in the west; and the construction of two tilapia fish farms to produce 6000 tons of fish.

The human resource capacity of the Fisheries and Aquaculture Department will be strengthened with the entry of twenty-three newly graduated agronomist into the sector, seventeen of whom will be attached to the Fisheries and Aquaculture Department.

#### **4.3.2 Discussion**

The following resulted from the discussions:

- The objectives of the aquaculture project to be done under the ACP Fish II Project and the one under the CRFM/JICA Master Plan Study should be clarified in order to avoid duplication.
- The impact on the existing population of lakes should be taken into consideration when introducing alien species.
- Inadequate maintenance of the cold chain could lead to inefficiencies and losses in processing and distribution.

### **4.4 Jamaica**

#### **4.4.1 Summary**

The project design matrix commenced at the First Regional Workshop was completed during the inter-sessional period. The proposed project goal is to increase aquaculture production, with expected outputs being increased supply of quality seedstock; increased access to markets; increased income generated by fish farmers; and strengthened capacity of extension services.

Stakeholder consultations were held on 19 August 2011. Among the numerous problems/challenges to aquaculture development identified, the main ones ranked in order of importance were: high feed price, high prices of the fish; inadequate governmental support; inadequate marketing; cheap imported fish; and inadequate access to credit. The PDM was revised taking into consideration the concerns of the farmers.

#### **4.4.2 Discussion**

The following points came out from the discussions:

- The impact of fish and fish products coming in under the CSME on the local market share should be studied.
- Marketing efforts should shift from promoting tilapia as a cheap source of protein to a wholesome first class product.
- In order to target the high end market, good product standards would need to be developed and maintained.
- Jamaica could look towards targeting the niche market for organically produced fish and fish products.

## 4.5 Suriname

### 4.5.1 Summary

After the First Regional Aquaculture Development Planning Workshop, the draft outline of the aquaculture development plan was used to prepare the national aquaculture development plan for 2011-2015. This plan has been used to prepare a so called “white paper” which will serve as the basis for aquaculture development in Suriname.

This white paper has been discussed at various stakeholder meetings, the last on a national level, and the various inputs and criticisms from the sector were used to refine the document until there was agreement among all the stakeholders and the Ministry. It should be noted that the section dealing with the rehabilitation of aquaculture farms would be taken out as it has been deemed to not be realistic at this time, and the monitoring of mercury contamination in Surinamese rivers would be added.

The completion of this phase of the process was concluded in July 2011. The details such as determination of implementation cost to be proposed for funding and detailed timeline/plan of operations are currently taking place.



*Dr. Anand Chotkhan presenting Suriname's Progress Report*

#### **4.5.2 Discussion**

Based on the discussions, participants noted the following:

- The issue of mercury contamination would require inter-sectoral planning and intervention.
- Transboundary issues should tap into existing regional initiatives to avoid duplication.

### **4.6 Trinidad and Tobago**

#### **4.6.1 Summary**

A series of meetings were held with representatives of the two aquaculture organizations {Aquaculture Association of Trinidad and Tobago (aQua-TT) and Tilapia Growers Association (TGA)}. The meetings were requested by the stakeholder representatives to address issues which were believed to be shortcomings of the Aquaculture Incentive Programme and other factors which were critical to aquaculture development.

The outcomes of these deliberations were to inform a position paper for presentation to the Minister of Food Production, Land and Marine Affairs. Fisheries Division hosted these meetings and, cognizant of the work which was supposed to be completed within the inter-sessional period, raised the issue of the revision of the Draft Policy for Aquaculture Development. It was agreed that it was important and would be done in consultation with all the aquaculture stakeholders.

In keeping with an initiative of the Ministry of Food Production, Land and Marine Affairs (which is the head Ministry of Fisheries Division and the Aquaculture Unit), Tilapia was selected as one of the commodities for which production should be developed. Other commodities which were identified included:

1. Staples (cassava, rice, bananas, sweet potatoes, etc)
2. Fruits (paw paw, water melon, mangoes, etc)
3. Vegetables and legumes (lettuce, peas, beans, patchoi, etc)
4. Small ruminants (sheep, goats)
5. Large ruminants (cattle, buffalypso)

The Fisheries Division, other agencies (Institute of Marine Affairs, University of the West Indies, Sugar Cane Feeds Centre) and the farming stakeholders (aQua-TT, TGA) were mandated to identify and determine the factors which were critical in moving the Aquaculture/Tilapia subsector forward.

Four (4) groups were formed which were responsible for issues related to:

- Training, research and development, testing and demonstration, human resources and extension services.
- Production.
- Value chain supply and policy framework.
- Processing, promotional marketing.



The groupings basically reflected the outcome of the problem and objective analysis from the first planning and development workshop.

The groups consisted of agency and non-agency personnel. A further instruction was to formulate the findings of these groups into an action plan which would identify: targets/objective; strategies/major actions; activities; resources; time in years; responsible agency; impact/remarks. This would best form/reflect the enabling environment necessary for sustainable aquaculture development in Trinidad and Tobago.

The action plan was presented to a Heads of Division Meeting of the Ministry of Food Production, Land and Marine Affairs where other actions plans were being presented, further information was required and the plan continues to be a work in progress at this time.

#### **4.6.2 Discussion**

As indicated above, Trinidad and Tobago did not participate in the Workshop, but submitted the above summary of the inter-sessional activities undertaken and two other documents entitled “Tilapia Commodity Action Plan” and “Aquaculture Action Plan”, which are attached at **Appendix 3**, as indications of their planning efforts to promote development in the aquaculture sub-sector.

#### **4.7 Recommendation**

In addition to points identified under the discussions of the various country presentations, participants also recommended that the countries should finalise their Draft Aquaculture Development Plan and submit them the CRFM Secretariat by September 15, 2011, for inclusion in the Master Plan. This would afford some opportunity for donor review and possible funding.

#### **5.0 Field Trip**

As part of the Workshop programme, participants were taken on a field trip to three small-scale fish farms in a cluster at James Hill to observe the work done under the Pilot Project *Training and Extension with Small-scale fish Culture*. A full report of the field visit is included at **Appendix 4**.

#### **6.0 Presentations on the Aquaculture Pilot Projects**

##### **6.1 Low cost small-scale Aquaculture Development Pilot Project - Belize**

Mr. Rigoberto Quintana, Marine Aquaculture Officer, Belize Fisheries Department, made the presentation on the pilot project: *Implementation of Alternative Feeds in Tilapia Farming*, which was conducted in Belize. A summary of his presentation is set out below. The full powerpoint presentation is attached as **Appendix 5(A)**.



*Mr. Rigoberto Quintana making the presentation on the Belize Pilot Project*

### Summary

Small-sale aquaculture is an important activity that can contribute significantly to food security and poverty alleviation in the CARICOM Region. In Belize, the development of this sector has been impeded by the high cost of production inputs and limited technology transfer. The pilot project implemented under the JICA/CRFM Master Plan Study in Belize was meant to identify and evaluate the suitability of using low cost input and low cost aquaculture production techniques focused on the reduction of feeding cost for small-scale tilapia farming, with the expected output being an evaluation of the cost effectiveness of using locally available low cost feed and other low cost aquaculture production techniques compared to the existing techniques which totally rely on the use of commercial feed. The trials examined the cost structure and profitability of small-scale tilapia farming using locally available low cost feeds and aquaculture techniques.

At the Fisheries Department Biscayne Seedstock Production Facility, eight ponds were prepared and stocked at 5 fingerlings/m<sup>2</sup> (1-2 grams ABW). Trials using four diets (Shrimp Feed, Regular Rice Bran, Fermented Rice Bran and Mill feed) were conducted in 2 phases (Phase I for 148 days and Phase II for 117 days). Fish growth was monitored every two weeks to determine the average body weight (ABW).

The trials indicated that shrimp feed is the most expensive and yields the best growth rates and feed conversion (FCRs). The 50-50 presentation of Shrimp Feed and Fermented Rice Bran showed the second best growth rates, while reducing feed cost by 21.6% when compared to shrimp feed alone and by 40% when compared to commercial tilapia feed. Mill Feed and fermented mill feed diets showed faster growth rates (g/day) than rice bran and fermented rice bran, but higher FCR ratios and production costs than the rice bran based diets.

Physical and chemical parameters in ponds and potential bird predation might have contributed to the low survival rates, especially during Phase I. Improved survival rates were noted in all ponds in Phase II, which might be attributed to the addition of anti-bird netting in the later part of the phase.

## **6.2 Small-scale Aquaculture Training Pilot Project - Jamaica**

Mr. Robin Hall, Consultant, gave the presentation on the pilot project: *Improvement of Small-scale Tilapia Aquaculture in Jamaica through Extension and Training*. Following is a summary of his presentation and the powerpoint presentation is attached as **Appendix 5(B)**.

### Summary

Current estimates for annual per capita consumption of fish in Jamaica are set at 16kg/annum, which is higher than the 11kg/annum for the region but less than the 20kg/annum for developed countries. Local per capita consumption of tilapia is estimated at 1.6kg/annum. The relative contribution of local aquaculture production to the local marine fish catch and total national fish supply is on average 37% and 9.9% respectively. The current farm-gate value of aquaculture production in Jamaica is estimated at J\$688 million for tilapia, and J\$194 million for shrimp, or the total equivalent of US\$12.1 million. All local aquaculture production, albeit in decline since 2006, is being consumed locally.

The vast majority of aquaculture farms in Jamaica fall within the range of medium to small scale. These farms, with an average size of 14.1 acres/5.7 hectares, account for approximately 78% of the total number of fresh water food fish farms and for 15 – 24% of the area under production.

Within the context of national fiscal constraints, the threatened state of local (possible regional) fish stocks and the relatively high per capita demand for fish and fishery products, the preservation and expansion of the local aquaculture industry is critical to national food security, food sovereignty, economic development of the country and job creation.

The objectives of the pilot project were to improve management practices, economic returns and extension delivery in small scale aquaculture. The project activities included a base line survey, pond demonstration, three-day training workshop for fish farmers, selection of farmers for field monitoring, on farm extension, market support and project evaluation.

The baseline survey utilizing primary and secondary data was used to gather historic, human, socioeconomic, environmental, technical, and market data for small scale aquaculture producers. The data sets gathered were then analyzed with a view to characterizing potential farmers, thus allowing for the formulation of effective interventions/ transforming processes.

The opportunities identified were food security, natural resource utilization, contribution to rural agricultural diversification and alternative livelihoods.

Notwithstanding these opportunities, 51% of farms surveyed were out of production indicating the existence of major challenges to subsistence tilapia farming activity. The identified challenges included insufficient technical knowhow, lack of best management practices, high feed cost, poor feed management and ineffective extension support. Combined, these result in poor economic returns to the farm units.

Despite increased efficiencies and re-ignited interests, the following areas warrant further or continued attention: reliable economic models that compare/present profitability of intermediate grow out of advanced fry to 20 – 30 gram fingerlings as a stand-alone activity or in support of further grow out of 20 -30gm fingerlings as compared to advanced fry; greater recognition/support by Government, through a clearly stated policy position on small scale aquaculture activity; support to establish market outlets; and the implementation of low cost interventions that would improve crop survival such as improved seed delivery techniques, effect treatment of macro algal growth in ponds; and installation of bird deterrent devices.

## **7.0 Regional Network of Aquaculture Organizations**

### **7.1 Summary**

A draft concept paper titled: *Formation of a Regional Network of Aquaculture Organizations*, prepared by the Programme Manager, Fisheries Management and Development, CRFM Secretariat, was reviewed and refined during the inter-sessional period. The revised draft concept paper, which appears at Appendix 6, was presented and discussed. The presentation covered the definition of a network; the NACA model; formation of the CARICOM/CRFM network of aquaculture organizations and the way forward.

### **7.2 Discussion**

Following on the presentation and discussion, the participants recommended that the IC Net Consultants should develop the Concept Paper into a project proposal and include it in the Master Plan. They also suggested that the proposal should include the following:

- A CRFM Working Group that would be responsible for the establishment of the Network, with the network first being developed within the CARICOM/CRFM area.
- Stakeholder analysis to identify the likely participants in the Network
- A position for a network coordinator
- Identification of other aquaculture networks with which the CRFM Network could create linkages, e.g. NACA, the one being developed under OSPESCA, etc.

Participants also recommended that “the promotion of sustainable aquaculture development” should be added on the draft agenda for the upcoming Joint CRFM/OSPESCA Meeting.

## **8.0 Potential Role of the University of the West Indies (UWI) in Regional Aquaculture Development – Update**

Among the potential roles for UWI in regional aquaculture development planning are training, capacity building and research. The following initiatives have been undertaken since the first regional workshop in March 2011:

- 1) Collaboration between the Institute of Marine Affairs (IMA) in Trinidad and Tobago, UWI-School of Veterinary Medicine (UWI-SVM), and Fishgen Ltd. at University of Wales Swansea (UWS) to facilitate a workshop on the Design, Engineering and Operation of Re-circulating Aquaculture Systems. The workshop was attended by 32 current and prospective aquaculture

farmers. In addition to presentations by facilitators on topics such as Fish Health Management, and various aspects of System Design and Management, presentations were also made by various officials including:

- Mr. Harnarine Lalla, Fisheries Officer in charge of Aquaculture at the Ministry of Food Production, Land and Marine Affairs, who included in his presentation the financial and technical resources and incentives that are being offered by the government to aquaculture producers
- The Agricultural Development Bank of Trinidad and Tobago, which provided information on the financing available for aquaculture ventures
- The Environmental Management Authority (EMA), which provided farmers with information on the regulations surrounding the establishment of aquaculture production facilities and the management of effluent from such facilities
- The Marine Chemistry Department of the IMA - which provided guidance on water quality parameter monitoring.

There is great demand for a second such training workshop, as the number of applicants far exceeded the spaces available for this workshop. Since the conclusion of the training, the UWI-SVM has worked with a number of workshop participants in managing the health of their systems.

- 2) Ministry officials engaged in meetings with various aquaculture commodity groups in Trinidad and Tobago regarding incentives being offered by the government to encourage aquaculture development, as well as informing the stakeholders of the push towards the formation of the regional network.
- 3) The UWI Centre for Resource Management and Environmental Studies (CERMES) was contacted regarding potential projects that may arise out of the formation of the regional network. They have indicated their willingness to assist in projects that may be of benefit to regional industry development.
- 4) In response to the need for more affordable feeds in the region, the IMA was approached with regards to collaborating with UWI and potentially serving as a feed trial experimentation site. They have expressed their willingness to participate and project discussions are being conducted. One potential trial may involve the use of the *Moringa oleifera* as a potential feed supplement for food fish production. The Agrobiodiversity Unit at the Ministry of Food Production, Land and Marine Affairs has indicated that they are beginning to collect seeds from this plant across Trinidad and Tobago and the possibility of there being a constant source of sufficient quantities of this crop and the potential for its incorporation into fish feeds will be explored.
- 5) The Norwegian food research institute, NOFIMA, is collaborating with a group of local tilapia producers to potentially establish an intensive tilapia and barramundi production facility. Depending on the outcome of this collaboration, NOFIMA officials and the UWI may work towards conducting further training workshops for local and regional industry extension officers and aquaculture farmers.

## **9.0 Closing Ceremony**

At the end of the Workshop, closing remarks were made by the Director, Aquaculture Branch; Deputy Team Leader, IC Net Limited; CEO Fisheries Division, Jamaica; and the PM FMD.

## Appendix 1: List of Participants

| #  | Country  | Name                         | Position  | Email  |
|----|----------|------------------------------|---|--|
| 1  | Belize   | Mr. Miguel Sosa              | Assistant Fisheries Officer, Aquaculture Section        | <a href="mailto:aquaculturemiguel@yahoo.com">aquaculturemiguel@yahoo.com</a>       |
| 2  |          | Mr. Rigoberto Quintana       | Marine Aquaculture Officer                              | <a href="mailto:bertoquintana@gmail.com">bertoquintana@gmail.com</a>               |
| 3  | Guyana   | Ms. Addevi Persaud           | Head of Aquaculture                                     | <a href="mailto:addevi_p@yahoo.com">addevi_p@yahoo.com</a>                         |
| 4  | Haiti    | Mr. Jean Robert Badio        | Director of Fisheries                                   | <a href="mailto:robertbadio@yahoo.com">robertbadio@yahoo.com</a>                   |
| 5  | Jamaica  | Ms. Avery Smikle             | Director of Aquaculture Branch                          | <a href="mailto:adgalbraith@gmail.com">adgalbraith@gmail.com</a>                   |
| 6  |          | Mr. Dehaan Brown             | Senior Researcher                                       | <a href="mailto:brown1_de@yahoo.com">brown1_de@yahoo.com</a>                       |
| 7  | Suriname | Dr. Anand Chotkan            | Veterinary Officer                                      | <a href="mailto:a_chotkan@hotmail.com">a_chotkan@hotmail.com</a>                   |
| 8  | CRFM     | Mr. Terrence Phillips        | Programme Manager, Fisheries Management and Development | <a href="mailto:terrencephillips@vincysurf.com">terrencephillips@vincysurf.com</a> |
| 9  | Japan    | Mr. Kazuo Udagawa            | Deputy Leader of the Study Team                         | <a href="mailto:udagawa@icnet.co.jp">udagawa@icnet.co.jp</a>                       |
| 10 |          | Mr. Mitsuo Iinuma            | Member of the Study Team                                | <a href="mailto:iinuma@icnet.co.jp">iinuma@icnet.co.jp</a>                         |
| 11 |          | Mr. Robin Hall               | Project Coordinator, Pilot Project in Jamaica           | <a href="mailto:robinhall63@yahoo.com">robinhall63@yahoo.com</a>                   |
| 12 |          | Ms. Natasha Clarke           | Project Assistant, Pilot Project in Jamaica             | <a href="mailto:natasha.clarke@hotmail.com">natasha.clarke@hotmail.com</a>         |
| 13 | Haiti    | Ms. Murielle Felix           | Head of Aquaculture                                     | <a href="mailto:yielloue@yahoo.fr">yielloue@yahoo.fr</a>                           |
| 14 | UWI      | Dr. Ayanna Carla N. Phillips | Lecturer, UWI School of Veterinary Medicine             | <a href="mailto:phillipsacn@gmail.com">phillipsacn@gmail.com</a>                   |

## Appendix 2: Agenda

| Date    |     | Training Content  | Venue  |
|---------|-----|---|--|
| Aug. 28 | Sun | Arrive in Kingston (Only Foreign Participants)  |  |
| Aug. 29 | Mon | Opening Ceremony<br>08:30 – 09:40 Opening Session & Orientation<br>Session I : Presentation of Progress of Aquaculture Development Planning<br>10:00 – 10:40 Progress Presentation (1 countries)<br>10:40 – 11:00 Coffee Break<br>11:00 – 12:20 Progress Presentation (2 countries)<br>12:20 – 13:20 Lunch<br>13:20 – 14:40 Progress Presentation (2 countries)<br>14:40 – 15:00 Coffee Break<br>15:00 – 15:40 Progress Presentation (1 country)<br>15:40 – 16:30 General Discussion  | Pool Side Conference Room, Hotel Four Seasons (Kingston) |
| Aug. 30 | Tue | Session II: Observation of Field Sites of the Pilot Project<br>08:00 – 10:30 Move from the Hotel to Clarendon<br>10:30 – 11:30 Visit to a fish farmer participating in the project<br>11:30 – 12:00 Move<br>12:00 – 13:00 Lunch at the town<br>13:00 – 13:30 Move<br>13:30 – 14:30 Visit to a fish farmer participating in the project<br>14:30 – 17:00 Move to Clarendon to the Hotel  | Small-scale Tilapia Farms in Clarendon                   |
| Aug. 31 | Wed | Session III : Presentation of Pilot Projects on Aquaculture<br>09:00 – 10:30 Progress of Pilot Project in Belize<br>Experiment of Extensive Fish Culture<br>(by an officer in charge of Belize project)<br>10:30 – 11:00 Coffee Break<br>11:00 – 12:30 Progress of Pilot Project in Jamaica<br>Training and Extension of Small-Scale Fish Culture<br>(by a local contractor / an officer in charge of Jamaica project)<br>12:30 – 13:30 Lunch<br>Session IV : Regional Networking on Aquaculture Development<br>13:30 – 15:00 Presentation and Discussion of Regional Networking on Aquaculture Development<br>(by Mr. Terrence Phillips, CRFM)<br>15:00 – 15:30 Coffee Break<br>Session V : Evaluation of Overall Regional Workshop<br>15:30 – 16:30 Evaluation of Regional Workshops<br>Closing Session:<br>16:30 – 17:00 Closing Session | Pool Side Conference Room, Hotel Four Seasons (Kingston) |
| Sep. 1  | Thu | Leave Kingston (Only Foreign Participants)  |  |

## Appendix 3: Country Progress Reports

### Belize Progress Report



## Belize Progress Report

Effort to develop a Draft National Aquaculture Plan  
Belize Fisheries Department  
For 2<sup>nd</sup> Regional Aquaculture Workshop, CRFM/JICA  
August 28, 2011; Kingston, Jamaica  
Prepared by Miguel Sosa





## March 2010

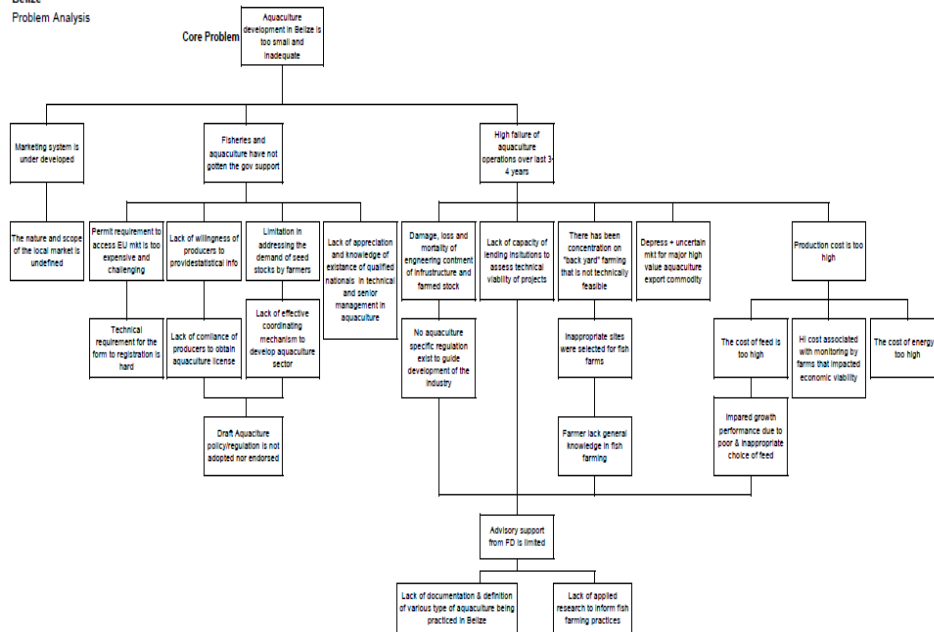
- Belize attended the First CRFM/JICA Regional Aquaculture Development Workshop.
- A Problem Analysis was prepared and an Objective Analysis was created from this exercise.
- A potential project was then selected based on various criteria such as urgency, cost, human resources and feasibility.



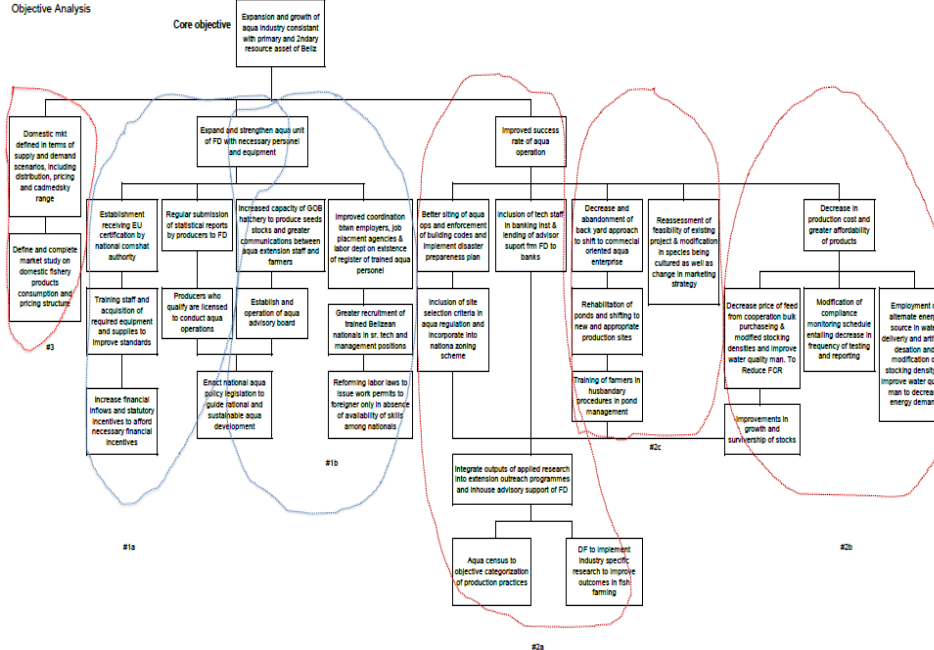
## Outputs of the First Workshop

- Problem Analysis
- Objectives Analysis
- Potential Project for National Aquaculture Development in Belize
- Project Selection
- PDM prepared for Potential Project to revitalize Aquaculture in Belize

Belize  
Problem Analysis



Belize  
Objective Analysis





## Proposed Project for Belize

- Country: Belize
- Project Title: National Aquaculture Revitalization
- Target Group: Aquaculture Producers and Lending Institutions
- Target Area: Marine, Coastal & Inland Aquaculture Areas
- Project Period: 18 months



## Narrative Summary

- Overall Goal: To expand the aquaculture industry on a sustainable basis.
- Project Purpose: Increase prospects for success of commercial aquaculture operations.



## Narrative Summary

- Output 1: Improved designation of aquaculture operations.
- Output 2: Improved screening of loan applications by banking institutions.
- Output 3: Decreased production costs.



## Activities

- Enact legislation with side selection criteria and include relevant clauses in Licenses granted to farmers.
- Definition and implementation of national zoning scheme for aquaculture.
- Research of nutrient loading at cage cultures sites and shrimp farming affluent stream.



## Activities

- Tech evaluation of Aquaculture loan application by Fisheries Department on behalf of banks.
- Workshop to train field officers of banking institutions on technical aspects of aquaculture.
- Development of cost models on various species and production systems at varying scales of operations.



## Activities

- Facilitate bulk purchasing of aquaculture feed and share costs on other services by organizing small farmers into associations and a national cooperative.
- Integration of Windmills as energy sources to pump water into reservoirs and pond production systems.



## Activities

- Experimentation on 4 alternative diets based on locally available material to substitute or supplement expensive commercial diets.



## Inputs: Personnel

- Act #1: Senior Aquaculture Management and Staff, Fisheries Research Licensing Officer, Fisheries Department
- Act #2: Senior Aquaculture Management & Staff
- Act #3: Aquaculture Staff Fisheries Department



## Inputs: Equipment & Materials

- Act #1: Computer
- Act #2: Computer & Audiovisual
- Act #3: Computer, audiovisual & field testing equip.



## Inputs: Facilities

- Act #1 Office Space & Transportation
- Act #2 Office Space & Transportation
- Act #3 Office Space & Transportation, Field Station

## Inputs: Operational Cost

- Act #1 Fixed Operational Cost
- Act #2 Recurrent & Fixed Operational Cost
- Act #3 Capital Cost, Operational Recurrent Cost & Operational Fixed Cost

## Progress after the Workshop





## Recent Activities: PCM &PDM

- The Project Cycle Management and its Project Design Matrix were taught to the staff of the Belize Fisheries Department.
- A two day workshop was carried out by Mr. George Myvett and Mr. Miguel Sosa.
- The Capture Fisheries Unit, the Conservation Compliance Unit, Aquaculture Technical Monitoring team and Ecosystem Management Units participated.

## Project Cycle Management at Belize Fisheries Department



## Project Cycle Management at Belize Fisheries Department



## Project Cycle Management at Belize Fisheries Department



## CCU'S Proposed Project

Project title: The Establishment of Fisheries Enforcement Training Program with key Stakeholders

Project period: One year

Target group: Judiciary, Fishing communities, Stakeholders, Maritime agencies

| Narrative Summary   | Objectively verifiable Indicators  | Means of verification   | Important assumptions  |
|---|--|---|--|
| <b>Overall goal</b><br>To strengthen and improve the effectiveness of the enforcement of Fisheries Laws in Belize   | Improve budgetary process to incorporate technical input from the Fisheries Department   | Increase budget for enforcement by 50%  | Political will from the Ministry of Finance and the Ministry of Agriculture and Fisheries                |
| <b>Project purpose</b><br>To improve collaboration and to garner political commitment for effective enforcement   | Increase consultations and trainings on enforcement issues with stakeholders, fishers and inter-agencies   | 10 consultations and trainings on Fisheries Laws and enforcement issues in the Main Fishing Communities | Budgetary allocations from the Ministry of Finance is adequate   |
| <b>Outputs</b> <ul style="list-style-type: none"> <li>• Training programs implemented</li> <li>• Stakeholder relationship strengthened</li> <li>• Fisheries enforcement issues prominently tabled at various coordinating mechanisms (FAB, JICC, JNEAM, BFCA-AC)</li> </ul> | 1000 trained fishermen;<br>6 members of the Judiciary trained on the Fisheries Laws<br><br>Participate in 8 JIC and FAB meetings, 12 JNEAM Meetings and 2 BFCA-AC Meetings | 10 Consultation reports and 10 Participation lists<br><br>Minutes from each meeting                     | Full participation from stakeholders<br><br>Inter-Agency Coordinating meetings will be held as scheduled |

## CCU's Proposed Project

| Activities  | Inputs   |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>• Review updated Fisheries Act</li> <li>• Sensitize Judiciary system</li> <li>• Educate stakeholders, communities on benefits of compliance</li> </ul> | <ul style="list-style-type: none"> <li>• Audio-visual equipment</li> <li>• Staff participation</li> <li>• Resource material</li> <li>• Venue</li> <li>• Vehicle (s)</li> <li>• Vessels/Fuel</li> </ul> | Full participation from stakeholders<br><b>Pre-conditions</b><br>Good working stakeholder relationship |



## Proposed Project: from CRFM/JICA workshop National Aquaculture Revitalization

- Contact was made with Banks and Credit Unions of Belize.
- The proposed project was presented to Loans Department of each lending institution.
- They were then interviewed on their past experiences with aquaculture ventures.



## Interaction with Credit Unions

- St. John's Credit Union (Belize & Cayo)
- Micro finance program
- Small Business Loans
- 1% monthly declining Balance interest
- Recently received grant from E.U. to obtain a 4x4 Pickup, GPS, and outdoor laptop to provide service to rural customers.



## Interaction with Credit Unions

- Holy Redeemer Credit Union (Belize)
- Oldest credit union in the country
- The HRCU has provided loans in the past for agriculture and fishing ventures but never for aquaculture ventures.
- Very interested in participating.
- Would like to see our Proposal.



## St. Francis Xavier Credit Union

- Very interested in participating. (Corozal)
- They have lent funds to five (5) cane farmers who were expanding into fish farming.
- The north is the region of the country where the sugar industry is based. The loss of E.U. preferential prices and the financial woes of the milling company has some farmers looking at diversification.



## La Immaculate Credit Union

- Yes will participate. (Orange Walk)
- They have recently managed an E.U. Project with the objective of providing grants to three communities interested in branching into tilapia farming.
- One recipient of the grant is a high school focused on agricultural education, the second is a group of cane farmers and the third is a group of fishermen.



## Commercial Banks

- Belize Bank Limited is very interested in participating in the workshops and would like to see the development of cost models for fish farms.
- Development Finance Corporation is interested and has not made loans to aquaculture ventures as yet. 8% interest rate. Lower than commercial banks.



## Commercial Banks

- First Caribbean International Bank not able to respond. This bank foreclosed on the only large scale Tilapia farm in the country. Fresh Catch Belize Ltd. was placed into receivership in September 2010.
- Recent efforts by the previous owner to barrow funds from the national social security program to purchase the company were not approved by the board of directors of SSB.



## Commercial Banks

- Scotia Bank, Heritage Bank and Atlantic Bank have yet to be contacted.
- Atlantic Bank is the largest commercial Bank in the nation. It has the most competitive interest rates in the country.



## Future Activities

- Prepare a Project Budget and Proposal.
- Present project proposal to Ministry of Agriculture and Fisheries for approval and funding.
- Plan and organize three tilapia training workshops for loan officers and managers.
- One/month at the Biltmore Hotel Conference Room.
- One field trip to Biscayne Fish farm.



## Future Activities

- Plan and organize two round table discussions on how the creation of cost model for small, medium and large scale tilapia farms.
- One /month at the Biltmore Hotel Conference Room. Loan officer, managers, fisheries officers and active tilapia farmers
- Share cost models with the Ministry of Agriculture and Fisheries, Farmers and lending institutions.





## Future Activities

- Work together with the Cooperatives Department to unite scattered fish farmers into tilapia farming associations.
- After evaluation of activity and production only the best associations would be joined to form a national tilapia farmers cooperative.
- Bulk orders of feed could then be bought by the cooperative from Honduran plants.



## Future activities

- Acquire training for aquaculture ext. officers and equipment to establish a water quality laboratory at the Belize Fisheries Department.
- This lab would monitor nutrient loading and plankton blooms in fresh and salt water.
- Contract a full time lab tech to operate the lab.

## Future Activities

- Continue to experiment with Fermented Rice Bran and other agriculture by-products to supplement the diets of tilapia crops at the most appropriate periods in the crop.
- Obtain financial and technical assistance from the TaiwanICDF on tilapia farming.

Thank you for your attention and special thanks to the CRFM & JICA for the PCM training!



## **Guyana Progress Report**

### **Introduction**

The progress report is a report of the activities which took place during the inter-sessional period of the Regional Workshop on Aquaculture Development Planning. The progress report will entail the following: a short description of the inter-sessional activities, constraints affecting the inter-sessional activities and a summary of the draft action plan. The Project Design Matrix (PDM) of the Action Plan and the Plan of Operation (PO) of the Action Plan are attached.

### **Inter-sessional activities**

Compilation of the Project Design Matrix (PDM) - This was completed and is attached at the end of this report. The PDM is discussed in more detail in another section of the report.

Review of the aquaculture network concept paper – Ongoing

Compilation of Draft Aquaculture Development Action Plan - Completed

Stakeholder consultations and revision on the Draft Aquaculture Action Plan – The Action Plan was sent to the stakeholders, however they have not given their opinion on the Action Plan as yet. Efforts are still being made to obtain feedback.

### **Problems/Constraints**

The major problem that affected the development of the Draft Action Plan is the non-responsiveness and lack of cooperation from the stakeholders. The Action Plan was sent to stakeholders but there has been very limited feedback and as such, the Action Plan was not revised as thoroughly as the Department would have liked. This may be as a result of many of the stakeholders being out of the capital at different times during the inter-sessional period.

Overview of the Revised Draft Aquaculture Development Action Plan

The Project Development Matrix was developed and is attached. There are six (6) projects/areas of focus, each having its own purpose and objective:

#### **(i) The development of capacity in the aquaculture sector and research on quality feed formulation.**

Purpose: Sustainable production in fish farming.

It is expected that by focusing on this area will lead to increased capacity of aquaculture farms, increase in the number of trained aquaculturist, increased fish growth rate and adequate seed stock supply.

#### **(ii) Management.** Purpose: lower cost of production.

Some expected outputs include: lower cost of feed, reduction in loss due to praedial larceny, lower energy cost, increased access to heavy machinery by small farmers and adequate risk management by small farmers.

#### **(iii) Marketing.** Purpose: Improved marketing of locally produced aqua products.

Expected outputs include: development and implementation of appropriate marketing strategies and improved marketing research intelligence.

#### **(iv) Communication.** Purpose: Improved awareness of aquaculture practices, policies, etc.

Expected outputs include: improved communication with farming community, increased opportunities and involvement of youth in aquaculture development, development of clearly defined line of communication with policy makers and increased public awareness about aquaculture products.

**(v) Quality Assurance and Safety.** Purpose: Improved marketing and quality of locally produced aqua products.

Expected Outputs: Establishment and implementation of on-farm quality control management procedures.

**(vi) Aquaculture Policy and Zoning.** Purpose: Defining Aquaculture Policies Clearly.

Expected Outputs: Identification of land suitable for aquaculture and implementation of aquaculture legislation.

It is estimated that the duration for each project will be approximately five (5) years. All the necessary stakeholders should be involved in the planning, implementation and evaluation of the success of the above identified projects

## Annex 1: Draft Aquaculture Action Plan for Guyana

The purpose of this document is to clearly define the **Aquaculture Action Plan** which is based on the findings of the problem analysis and the objective analysis conducted.

Based on these analyses the following areas of focus were identified:

1. The development of capacity in aquaculture sector and research on quality feed.
2. Management
3. Marketing.
4. Communication
5. Quality Assurance and Safety
6. Aquaculture Policy and zoning

A brief summary of each project identified is set out below.

| Project  | Outputs   | Indicators  |
|--|---|---|
| The development of capacity in aquaculture sector and research on quality feed | <ol style="list-style-type: none"><li>1. There is improved on-farm aquaculture capacity.</li><li>2. There are sufficient numbers of trained aquaculturists</li><li>3. Faster fish growth</li><li>4. There is adequate seed stock supply</li></ol>                                 | <ol style="list-style-type: none"><li>1. At least 100 farms with on-farm aquaculture capacity, including trained personnel and equipment.</li><li>2. At least 300 farms with personnel equipped with adequate aquaculture skills</li><li>3. At least 50 professionals and technicians trained in aquaculture and other required skills.</li><li>4. A 1 lb fish in 5-6 months.</li><li>5. At least 3 hatcheries established with required capacity at strategic locations.</li></ol> |
| Management   | <ol style="list-style-type: none"><li>1. Lower cost of feed</li><li>2. There are adequate risk management mechanism</li><li>3. Reduced losses due to praedial larceny</li><li>4. Lower energy cost</li><li>5. There is access to heavy machinery for small aqua farmers</li></ol> | <ol style="list-style-type: none"><li>1. Reduction of feed cost by 10%</li><li>2. Establishment and use of risk management mechanism Aquaculture farming community.</li><li>3. Reduction of incidents by 50%</li><li>4. 25% farms using alternative sources of energy.</li><li>5. At least 8 Excavators available for construction of aquaculture ponds.</li></ol>  |
| Marketing.   | <ol style="list-style-type: none"><li>1. Development and implementation of appropriate marketing strategy</li></ol>   | <ol style="list-style-type: none"><li>1. Marketing strategy developed specifically for aquaculture products.</li><li>2. 100 trained marketing specialist</li></ol>  |

|                               |  |  |
|-------------------------------|--|--|
|                               | 2. Improved market research and intelligence   |  |
| Communication                 | <ol style="list-style-type: none"> <li>1. Improved communication with farming community</li> <li>2. Increased opportunities and involvement of youth in aquaculture development</li> <li>3. There are clearly defined line of communication w/ policy makers</li> <li>4. The public is adequately informed about the availability of aquaculture products</li> </ol> | <ol style="list-style-type: none"> <li>1. The creation of an aquaculture information booklet</li> <li>2. The implementation of a school outreach program</li> <li>3. Establishment of an information system to communicate with policy makers</li> <li>4. 50% increase in promotion of aquaculture products</li> </ol> |
| Quality Assurance and Safety  | <ol style="list-style-type: none"> <li>1. On-farm quality control management procedures are established &amp; implemented</li> </ol>   | <ol style="list-style-type: none"> <li>1. 75% of commercial farms practicing On-farm quality control management procedures</li> </ol>  |
| Aquaculture Policy and zoning | <ol style="list-style-type: none"> <li>1. Land suitable for aquaculture is identified</li> <li>2. Aquaculture legislation approved and being implemented</li> </ol>  | <ol style="list-style-type: none"> <li>1. Establish a Geographic information system.</li> <li>2. Aquaculture policy implemented and enforce.</li> </ol>  |

It is estimated that each project will be completed in approximately five (5) years and should involve all the necessary stakeholders in the planning, implementation and evaluation of the success of the above identified projects. Some possible sources of input would be JICA, FAO/UNDP, USAID, IDB and FAO.

| Country: Guyana   |   |     |  |     |  |     |  |  |
|---|---|-----|--|-----|--|-----|--|--|
| Project Title: The development of capacity in aquaculture sector and research on quality feed formulation |   |     |  |     | Target Group: Fish farmers and fishing community   |     |  |  |
| Project Period: 5 years (2012-2016)   |   |     |  |     | Target Area: Coastal zone  |     |  |  |
| Narrative Summary   |   |     |  |     | Indicators   |     |  |  |
| Overall Goal:   |   |     |  |     |  |     |  |  |
| Significant increase in growth of the aquaculture sector  |   |     |  |     | 1 Growth of the aquaculture sector increase by at least 10% by the end of the project period.  |     |  |  |
| Project Purpose   |   |     |  |     |  |     |  |  |
| Sustainable production in fish farming  |   |     |  |     | 1 Greater than 90% of farms are successful through the second production cycle and can be deemed self sufficient and can maintain production /output in response to industry demand over time. |     |  |  |
| Outputs   |   |     |  |     |  |     |  |  |
| 1   | There is improved on-farm aquaculture capacity.   |     |  |     | 1-1 At least 100 farms with on-farm aquaculture capacity, including trained personnel and equipment.   |     |  |  |
|   |   |     |  |     | 1-2 At least 300 farms with personnel equipped with adequate aquaculture skills.   |     |  |  |
| 2   | There are sufficient numbers of trained aquaculturists  |     |  |     | 2-1 At least 50 professionals and technicians trained in aquaculture and other required skills.  |     |  |  |
| 3   | Faster fish growth  |     |  |     | 3-1 A 1 lb fish in 5-6 months.   |     |  |  |
| 4   | There is adequate seed stock supply   |     |  |     | 4-1 At least 3 hatcheries established with required capacity at strategic locations.   |     |  |  |
| Activities  |   |     |  |     | Inputs   |     |  |  |
| 1-1   | Undertake a survey to determine on-farm capacity requirements                                 | 2-1 | Undertake a survey to determine the number of trained personnel required within the aquaculture sector.                              | 3-1 | Determine factors inhibiting fish growth within the national farming system.   | 4-1 | Determine seed stock requirements for the aquaculture sector.  | Personnel:<br>a. Aquaculture research expertise (USAID/GTIS, JICA, FAO/UNDP)   |
| 1-2   | Design and deliver required training program.   | 2-2 | Assess the area for which training is required.  | 3-2 | Conduct necessary research to determine strategies necessary to overcome. Identify critical factors.   | 4-2 | Identify the best/most suitable location for hatcheries, based on zoning and other relevant factors.     | b. Survey Design Expertise (with aquaculture experience) (JICA, FAO/UNDP, USAID)   |
| 1-3   | Design and deliver schemes for farmers to acquire and access required equipment.              | 2-3 | Design and deliver required training program, with professionals accessing local, regional and international training opportunities. | 3-3 | Disseminate research findings to relevant decision making authorities and other stakeholders.  | 4-3 | Design appropriate hatchery facilities equipped with adequate capacity, depending on zoning requirement. | c. Design/Delivery Expertise (for aquaculture training program) (USAID/GTIS, FAO/UNDP, JICA),<br><br>d. Communication Specialist (USAID, FAO/UNDP) |
| 1-4   | Monitor + evaluator that effectiveness of the delivery of information/technology transferred. | 2-4 | Provide career opportunities and incentives for locally trained personnel within the sector  | 3-4 | Promote the utilisation of research findings in the national farming system.   | 4-4 | Select/collect broodstock (purchased, donation, wild caught)   | e. HRD Expertise (with aquaculture experience) (USAID/GTIS, JICA, IDB)   |
| 1-5   |   | 2-5 | Monitor + evaluator/asses the impact of trained personnel on industry development.   | 3-5 | Monitor + evaluator/asses the impact of output of research findings on fish farming system, fish growth and make any required adjustments.   | 4-5 | Initiate breeding program and distribute fingerlings to farmers  | f. Project Management Expertise (with experience in monitoring and evaluation) (JICA, IDB)   |
| 1-6   |   | 2-6 |  | 3-6 |  | 4-6 | Monitor + evaluator/asses seed production progress and make appropriate adjustment as needed.            | g. Design / Delivery Expertise (Procurement specialist with experience in aquaculture farming systems) (JICA/USAID, IDB)                           |
| 1-7   |   | 2-7 |  | 3-7 |  | 4-7 |  | h. Aquaculture (Hatchery Development) Expertise (JICA, FAO/UNDP, USAID)  |
| 1-8   |   | 2-8 |  | 3-8 |  | 4-8 |  | Equipment & Materials:<br>- Workshop equipment and materials,<br>- Hatchery equipment,   |
| 1-9   |   | 2-9 |  | 3-9 |  | 4-9 |  | - Vehicles<br>- Materials for seed production<br>- Field survey equipment  |

|  |   |     |  |     |   |     |  |   |   |  |
|--|---|-----|--|-----|---|-----|--|---|---|--|
| Country: Guyana  |   |     |  |     |   |     |  |   |   |  |
| Project Title: Fish Management and Marketing             |   |     |  |     | Target Group: Fish farmers and fishing community                        |     |  |   |   |  |
| Project Period: 5 years                                  |   |     |  |     | Target Area: Coastal zone   |     |  |   |   |  |
| Narrative Summary  |   |     |  |     |   |     | Indicators   |   |   |  |
| Overall Goal   |   |     |  |     |   |     | 1  | Growth of the aquaculture sector increase by at least 10% by the end of the project period. |   |  |
| Significant increase in growth of the aquaculture sector |   |     |  |     |   |     |  |   |   |  |
| Project Purpose  |   |     |  |     |   |     | 1  | Production cost reduced by 10%  |   |  |
| Lower cost of production                                 |   |     |  |     |   |     |  |   |   |  |
| Outputs  |   |     |  |     |   |     |  |   |   |  |
| 1  | Lower cost of feed  |     |  |     |   |     | 1-1  | Redustion of feed coart by 10%  |   |  |
| 2  | There are adequate risk management mechanism  |     |  |     |   |     | 2-1  | Establishment and use of risk management mechanism<br>Aquaculture farming community.        |   |  |
| 3  | Reduced losses due to praedial larceny  |     |  |     |   |     | 3-1  | Reduction of incidents by 50%   |   |  |
| 4  | Lower energy cost   |     |  |     |   |     | 4-1  | 25% farms using alternative sources of energy.  |   |  |
| 5  | There is access to heavy machinery for small aqua farmers   |     |  |     |   |     | 5.1  | At least 8 Excavators available for construction of aquaculture ponds.                      |   |  |
| Activities   |   |     |  |     |   |     | Inputs   |   |   |  |
| 1-1  | Evaluate the cost of producing currently used feed  | 2-1 | Conduct survey to determining risk management needs.                   | 3-1 | Conduct survey to determining the cause and effect of praedial larceny. | 4-1 | Identify alternative sources of energy   | 5-1   | conduct survey to determine requirement   | Personnel:<br>a. Aquaculture research expertise (USAID/GTIS, JICA, FAO/UNDP)   |
| 1-2  | Identify cheaper or alternative source of feed material.  | 2-2 | Hold meeting with stakeholders to discuss terms amd means of coverage. | 3-2 | establishment, implimentation and enforcement of penalties.             | 4-2 | assess suitability   | 5-2   | hold meeting with stakeholders to present findings                              | b. Survey Design Expertise (with aquaculture experience) (JICA, FAO/UNDP, USAID)   |
| 1-3  | Incooperate materials identified in 1.2 into feed.  | 2-3 | Design framework for coverage of Aquaculture farms.                    | 3-3 | evaluat5 the effectiveness of measures taken.                           | 4-3 | conduct feasibility study  | 5-3   | establish framework for zoning and distribution of required number of machinery | c. Design/Delivery Expertise (for aquaculture training program) (USAID/GTIS, FAO/UNDP, JICA),                            |
| 1-4  | Evaluate performance of the feed and conduct feasibility study for use of the newly constituted feed. | 2-4 | Impliment measures and framework for coverage.                         | 3-4 |   | 4-4 | Design and deliver required training program.  | 5-4   | Monitor and Evaluate effectiveness .  | d. Communication Specialist (USAID, FAO/UNDP)  |
| 1-5  |   | 2-5 | Evaluate effectiveness .   | 3-5 |   | 4-5 | Design and deliver schemes for farmers to acquire and access required equipment.               | 5-5   |   | f. Project Management Expertise (with experience in monitoring and evaluation) (JICA, IDB)                               |
| 1-6  |   | 2-6 |  | 3-6 |   | 4-6 | Establish model farm   | 5-6   |   | g. Design / Delivery Expertise (Procurement specialist with experience in aquaculture farming systems) (JICA/USAID, IDB) |
| 1-7  |   | 2-7 |  | 3-7 |   | 4-7 | Monitor + evaluator that effectiveness of the delivery of information/technolog y transferred. | 5-7   |   | Equipment & Materials:<br>- Workshop equipment and materials,<br>- Vehicles<br>- Field survey equipment                  |



|  |  |     |  |   |   |
|--|--|-----|--|---|---|
| Country: Guyana  |  |     |  |   |   |
| Project Title: Marketing                                 |  |     | Target Group: Fish farmers and fishing community   |   |   |
| Project Period: 5 years                                  |  |     | Target Area: Coastal zone  |   |   |
| Narrative Summary  |  |     |  | Indicators  |   |
| Overall Goal   |  |     |  | 1   | Growth of the aquaculture sector increase by at least 10% by the end of the project period. |
| Significant increase in growth of the aquaculture sector |  |     |  |   |   |
| Project Purpose  |  |     |  | 1   | Marketing of aquaculture products increase by 75%   |
| Improved marketing of locally produced aqua products     |  |     |  |   |   |
| Outputs  |  |     |  |   |   |
| 1  | Development and implementation of appropriate marketing strategy                             |     |  | 1-1   | Marketing strategy developed specifcically for aquaculture products.                        |
| 2  | Improved market research and intelligence  |     |  | 2-1   | 100 trained marketing specialist  |
| Activities   |  |     |  | Inputs  |   |
| 1-1  | Conduct survey to identify area of focus.  | 2-1 | Undertake a survey to determine the number of trained marketing personnel required within the aquaculture sector.                    | Personnel:<br>a. Survey Design Expertise (with aquaculture experience) (JICA, FAO/UNDP, USAID)          |   |
| 1-2  | Hold meeting with stakeholders to discuss terms and means of promotion and marketing.        | 2-2 | Assess the area for which training if required.  | b. Marketing specialist with experience dealing with Aquaculture. (JICA, FAO/UNDP, USAID)               |   |
| 1-3  | Develop appropriate marketing strategy.  | 2-3 | Design and deliver required training program, with professionals accessing local, regional and international training opportunities. | c. Design/Delivery Expertise (for aquaculture training program) (USAID/GTIS, FAO/UNDP, JICA),           |   |
| 1-4  | Identify and impliment measures based on marketing strategy to promote aquaculture products. | 2-4 | Provide career opportunities and incentives for locally trained personnel whitin the sector  | d. Communication Specialist (USAID, FAO/UNDP)   |   |
| 1-5  | Evaluate the effectiveness of measures taken.  | 2-5 | Monitor + evaluator/asses the impact of trained personnel on industry development.   | e. HRD Expertise (with aquaculture experience) (USAID/GTIS, JICA, IDB)                                  |   |
| 1-6  |  | 2-6 |  | f. Project Management Expertise (with experience in monitoring and evaluation) (JICA, IDB)              |   |
| 1-7  |  | 2-7 |  | Equipment & Materials:<br>- Workshop equipment and materials,<br>- Vehicles<br>- Field survey equipment |   |

| Country: Guyana  |   |     |  |     |  |   |   |  |  |
|--|---|-----|--|-----|--|---|---|--|--|
| Project Title: Communication                             |   |     |  |     | Target Group: Fish farmers and fishing community |   |   |  |  |
| Project Period: 5 years                                  |   |     |  |     | Target Area: Coastal zone                        |   |   |  |  |
| Narrative Summary  |   |     |  |     | Indicators                                       |   |   |  |  |
| Overall Goal   |   |     |  |     |  |   |   |  |  |
| Significant increase in growth of the aquaculture sector |   |     |  |     | 1  | Growth of the aquaculture sector increase by at least 10% by the end of the project period. |   |  |  |
| Project Purpose  |   |     |  |     |  |   |   |  |  |
| Improved marketing of locally produced aqua products     |   |     |  |     | 1  | Marketing of aquaculture products increase by 75%   |   |  |  |
| Outputs  |   |     |  |     |  |   |   |  |  |
| 1  | Improved communication with farming community   |     |  |     | 1-1  | The creation of an aquaculture aquaculture information booklet                              |   |  |  |
| 2  | Increased opportunities and involvement of youth in aquaculture development           |     |  |     | 2-1  | The implimentation of a school outreach program   |   |  |  |
| 3  | There are clearly defined line of communication w/ policy makers                      |     |  |     | 3-1  | Establishment of an information system to communicate with policy makers                    |   |  |  |
| 4  | The public is adequately informed about the availability of aquaculture products      |     |  |     | 4-1  | 50% increase in promotion of aquaculture products   |   |  |  |
| Activities   |   |     |  |     | Inputs   |   |   |  |  |
| 1-1  | Conduct survey to identify area of interest for aquaculture farmers.                  | 2-1 | Hold meeting with stakeholders to discuss youth involvement. | 3-1 | Create a database of stakeholders                | 4-1   | Hold meeting with stakeholders to discuss method and means. | Personnel:<br>a. Aquaculture research expertise (USAID/GTIS, JICA, FAO/UNDP)   |  |
| 1-2  | Hold meeting with stakeholders to discuss terms and means of promotion and marketing. | 2-2 | Develop a school sensitisation program.                      | 3-2 | design information sharing system                | 4-2   | design information sharing system                           | b. Survey Design Expertise (with aquaculture experience) (JICA, FAO/UNDP, USAID)   |  |
| 1-3  | Identify and impliment most effective means of information transfer.                  | 2-3 | Implimentation of school sensitisation program.              | 3-3 | Impliment information sharing system             | 4-3   | Impliment information sharing system                        | c. Design/Delivery Expertise (for aquaculture training program) (USAID/GTIS, FAO/UNDP, JICA),                            |  |
| 1-4  | Evaluate the effectiveness of measures taken.   | 2-4 | Monitor and Evaluate   | 3-4 | Evaluate the effectiveness of measures taken.    | 4-4   | Evaluate the effectiveness of measures taken.               | d. Communication Specialist (USAID, FAO/UNDP)  |  |
| 1-5  |   | 2-5 |  | 3-5 |  | 4-5   |   | e. HRD Expertise (with aquaculture experience) (USAID/GTIS, JICA, IDB)   |  |
| 1-6  |   | 2-6 |  | 3-6 |  | 4-6   |   | f. Project Management Expertise (with experience in monitoring and evaluation) (JICA, IDB)                               |  |
| 1-7  |   | 2-7 |  | 3-7 |  | 4-7   |   | g. Design / Delivery Expertise (Procurement specialist with experience in aquaculture farming systems) (JICA/USAID, IDB) |  |
| 1-8  |   | 2-8 |  | 3-8 |  | 4-8   |   | Information and database development specialist. (USAID/GTIS, JICA, FAO/UNDP)  |  |
| 1-9  |   | 2-9 |  | 3-9 |  | 4-9   |   | Equipment & Materials:<br>- Workshop equipment and materials,<br>- Vehicles<br>- Computers<br>- Field survey equipment   |  |

|   |     |   |
|---|-----|---|
| <b>Country: Guyana</b>  |     |   |
| <b>Project Title: Quality Assurance and Safety</b>  |     | Target Group: Fish farmers and fishing community  |
| <b>Project Period: 5 years</b>  |     | Target Area: Coastal zone   |
| <b>Narrative Summary</b>  |     | <b>Indicators</b>   |
| <b>Overall Goal</b>   |     |   |
| Significant increase in growth of the aquaculture sector  | 1   | Growth of the aquaculture sector increase by at least 10% by the end of the project period.             |
| <b>Project Purpose</b>  |     |   |
| Improved marketing of locally produced aqua products  | 1   | Marketing of aquaculture products increase by 75%   |
| <b>Outputs</b>  |     |   |
| 1 On-farm quality control management procedures are established & implemented                     | 1-1 | 75% of commercial farms practicing On-farm quality control management procedures                        |
| <b>Activities</b>   |     | <b>Inputs</b>   |
| 1-1 Conduct survey to identify required training for aquaculture farmers.                         |     | Personnel:<br>a. Survey Design Expertise (with aquaculture experience) (JICA, FAO/UNDP, USAID)          |
| 1-2 Design and deliver required training program.   |     | b. Design/Delivery Expertise (for aquaculture training program) (USAID/GTIS, FAO/UNDP, JICA),           |
| 1-3 Design and deliver schemes for farmers to acquire and access required equipment.              |     | c. Communication Specialist (USAID, FAO/UNDP)   |
| 1-4 Promotion of on farm quality control measures   |     | d. Project Management Expertise (with experience in monitoring and evaluation) (JICA, IDB)              |
| 1-5 Monitor + evaluator that effectiveness of the delivery of information/technology transferred. |     | Equipment & Materials:<br>- Workshop equipment and materials,<br>- Vehicles<br>- Field survey equipment |

|  |  |     |  |  |
|--|--|-----|--|--|
| Country: Guyana  |  |     |  |  |
| Project Title: Aquaculture and zoning                    |  |     |  |  |
| Project Period: 5 years                                  |  |     |  |  |
| Narrative Summary  |  |     | Indicators   |  |
| Overall Goal   |  |     |  |  |
| Significant increase in growth of the aquaculture sector |  |     | 1  | Growth of the aquaculture sector increase by at least 10% by the end of the project period.                            |
| Project Purpose  |  |     |  |  |
| Aquaculture policy clearly defined                       |  |     | 1  | the implimentation and enforcement of aquaculture policy.  |
| Outputs  |  |     |  |  |
| 1  | Land suitable for aquaculture is identified                            |     | 1-1  | Establish a Geographic information system.   |
| 2  | Aquaculture legislation approved and being implemented                 |     | 2-1  | Aquaculture policy implimented and enforce.  |
| Activities   |  |     | Inputs   |  |
| 1-1  | conduct survey to determine land use, availability and susitability.   | 2-1 | Hold meeting with relavant stakeholders                          | Personnel:<br>a. Survey Design Expertise (with aquaculture experience) (JICA, FAO/UNDP, USAID)                         |
| 1-2  | Conduct taining on the establishment of Geographic information system. | 2-2 | review policy and correct where necessary.                       | b. Design/Delivery Expertise (for Geographic information system) (USAID/GTIS, FAO/UNDP, JICA),                         |
| 1-3  | Establish a Geographic information system.                             | 2-3 | impliment and enforce aquaculture poloicy                        | c. Communication Specialist (USAID, FAO/UNDP)  |
| 1-4  | Carry out zoning based on GIS  | 2-4 | publish policy to stakeholders                                   | d. HRD Expertise (with aquaculture experience) (USAID/GTIS, JICA, IDB)   |
| 1-5  | monitor and evaluate effectiveness and make changes if necessary       | 2-5 | monitor and evaluate effectiveness and make changes if necessary | e. Project Management Expertise (with experience in monitoring and evaluation) (JICA, IDB)                             |
| 1-6  |  | 2-6 |  | f. Information and database development specialist. (USAID/GTIS, JICA, FAO/UNDP)                                       |
| 1-7  |  | 2-7 |  | Equipment & Materials:<br>- Workshop equipment and materials,<br>- Vehicles<br>- Computers<br>- Field survey equipment |

## Haiti Progress Report



### Country Progress Report

Second Regional Workshop on Aquaculture Development Planning  
Jamaica , August 29 -31 , 2011

by : Badio, Jean Robert  
Director of Fisheries & Aquaculture in Haiti  
Ministry of Agriculture / Haiti

#### OVERVIEW ON AQUACULTURE IN HAITI

Haiti's aquaculture is characterized by a non commercial subsistence scale activities with low input feed based, mostly for personal consumption or local sale. Tilapia is the main principal species used in aquaculture in Haiti.

Aquaculture (freshwater-brackish water and marine) is very feasible in Haiti. There is a good potential's aquaculture development in various zone in the country. Trough ten (10) departments in the country more than 23.000 hectares of land not suitable for agriculture are very favorable for the development of commercial aquaculture fish farm.



**Aquaculture production** : 400 tons ( mostly tilapia and carp )  
**Continental production** : 600 tons ( more than 22 ,000 ha of body of water )  
**Hatchery production** : 3,5 millions of fingerlings per year  
**Cage production** : 160 tons  
**Consommation per capita** : 4,5 kgs per annum

Brief description on the inter- sessional activities undertaken in the development of the draft action plan for aquaculture .

Country : Haiti

Project period : 12 months period renewable

Over all goal ; Increase significantly the fish farmer productivity

Project purpose : Increase production at a significant level

Outputs : 1) feed stock is available at a affordable price  
2) fish quality is increased  
3) aquaculture equipments available

#### Activities

The Division of Fisheries and Aquaculture of Haiti in collaboration with the " Group the concertation " which is a National group of fisheries cooperative ; exporters ; fish farmers and others interested in the sector of fisheries and aquaculture in Haiti take the responsibility to manage all projects activities.

#### Activities for output :

Feed stock is available at a affordable price

- 1.1 : *Rehabilitated hatcheries facilities and other fish farms*
- 1.2 : *Increased production in existing hatchery and creation of new centers of production*
- 1.3 : *Research of nutrients aquaculture products existing in the country in order to make local feed.*
- 1.4 : *Production of fingerlings for stocking natural lakes and distribution to the private sector*
- 1.5 : *Stocking of water bodies ( 23,00 hectares of lakes )*
- 1.6 : *Develop broodstock management program*
- 1.7 : *Distribution of seed to all stake holders*
- 1.8 : *Advise hatchery management and laboratory management*
- 1.9 : *Monitor seed production process*

#### Activities for output II

Fish quality is increased

- 2.1 *Conducting studies on transformation ; conservation and commercialisation.*
- 2.3 *Hold meeting (training) for producers and sailors to learn new knowledge on conservation and transformation*

- 2.4 : Distribution material of transformation and conservation
- 2.5 : Conduct feasibility study for mariculture
- 2.6 : Conduct survey on marine species for mariculture
- 2.7 : Collect data for a better management and elaboration of a m Master Plan
- 2.8 : Monitoring and Evaluating activities

#### Activity for Output III

#### Aquaculture equipments available

- 3.1 : Establishment of farms production in cages and ponds
- 3.2 : Rehabilitation of farms with established potential
- 3.3 : Training and Technical assistance for aquacultors
- 3.4 : Survey the socio economic conditions in different areas.

|  |  |   | Core Problem  |   |  |   |  |
|--|--|---|---|---|--|---|--|
|  |  |   | Aquaculture is under development                      | Low level of production and lack of commercial approach       |  |   |  |
| Lack of seed stock   | Scarcity of people with adequate training and experience |   | Lack of equipments and facilities for aqua farmers    | Good farms and projects are abandoned and need rehabilitation | Farmers don't have post harvest skills to keep fish quality      | NGO's help to increase production in aquaculture        |  |
| Only one hatchery with low production is active                | Training for farmers and other stakeholders are missing  | Lack of education among aqua and fish farmers | Aquaculture equipment are expensive and not available | No credit available   | Fish conservation - transformation and marketing are not applied | Facilities for fish farming are under developed         |  |
| Lack of infrastructure development and services (roads, power) | There is no extension officers to train farmers          |   | Equipment such as nets, pumps, tanks and engines      | The government has other priority (earthquake, hurricane etc) | Need a model of aquaculture farm proven its rentability          |   |  |
|  |  |   |   |   |  |   |  |
|  |  |   |   |   |  |   |  |
|  |  |   |   |   |  |   |  |
|  |  |   |   |   |  |   |  |
|  |  |   |   |   |  |   |  |
|  |  |   |   |   |  | NGO's don't give enough technical support to farmers    |  |
|  |  |   |   |   |  | No government control on NGO's activities               |  |
|  |  |   |   |   |  | Policy of aquaculture does not exist                    |  |
|  |  |   |   |   |  | Lack of vision and no master plan for aquaculture exist |  |



## RECENT DEVELOPMENTS

After the workshop :

- a) Contact made to the group of concertation
- b) One day meeting with all stakeholders in Haiti to be informed about the PDM
- c) The Direction of Fisheries and Aquaculture in collaboration with the cubans technicians is trying to identify all aquaculture potentialities and activities existing in the country and prepare a national zoning scheme.
- d) Four new aquaculture activities are taking place . :  
( stocking lakes in the south east \_ Tilapia hatchery in the west – Aquaponics – two (2) pretty big tilapia fish farms now are in construction to produce 6000 tons of fish ( alimentation school cafeteria ) – food for the poor – zanmi agrikol.
- e) 23 freshly diplomed agronomist are inter the sector and 17 of them are going doing to be at the fisheries department



## Future activities

- New office
- Baseline survey in october
- Acp
- Workshop in lake construction ( cage production )
- Training for the new coming
- Unite scattered fish farming into associations
- water quality laboratory
- Distribution of aquaculture materials to 15 associations
- Build two new fish farms ( tilapia ) and make them rentable to encourage and sell them to the private sector
- Prepare a budget for our project.



Mesi bokou



## **Jamaica Progress Report**

### JICA/CRFM Aquaculture Development Plan Workshop

Progress Report  
August 29, 2011

## Jamaica's Project Design Matrix

- PDM Completed  
(See Matrix)

### **Proposed Goal:**

Increase Aquaculture Production

## Proposed Outputs

- Increased supply of quality seedstock
- Increased access to markets
- Increased income generated by fish farmers
- Strengthened capacity of extension services

## PDM Assumption

- **Assumptions:**
  - ☐ The New Fisheries Laws and Regulations are enacted
  - ☐ Policy support for Aquaculture development remains intact
  - ☐ Natural disasters does not negatively affect the industry's infrastructure
  - ☐ Pending government modernizing of the public sector does not entail the staff cuts at the Aquaculture Branch
  - ☐ Market price of tilapia remain stable

## Stakeholder Consultations

Stakeholder consultations held August 19, 2011

Farmers (Large, Medium and Small)

Forty (40) problem indentified included with the main ones ranked in order of importance:

1. Feed price
2. Prices of the Fish
3. Inadequate governmental support
4. Marketing
5. Cheap imports fish
6. Access to Credit

## Stakeholder Consultations

PDM revised and concerns of the farmers

Added

### PROJECT DESIGN MATRIX – JAMAICA

**Project Title:** Revitalization of the Aquaculture Sub-sector in Jamaica  
**Project Period:** January 2012 - December 2017

**Target Group:** Fish farmers, Extension officers  
**Target Area:** Northern Clarendon and St. Ann; Eastern St. Thomas; Hillrun, St. Catherine.

| NARRATIVE SUMMARY   | OBJECTIVELY VERIFIABLE INDICATORS   | MEANS OF VERIFICATION  | ASSUMPTIONS  |
|---|---|--|--|
| <b>Goal:</b><br>To increase aquaculture production  | Sales of live fish/fresh whole fish increased by 10%<br>Feed sales increased by 20%<br>Fingerling supply increased by 30%   | Market survey conduct of major retail and wholesale outlets<br>Data from feed mill and tilapia hatcheries  |  |
| <b>Project Purpose:</b><br>Increase consumption of locally produced tilapia   | Consumption of tilapia increased by 25%.  | Farm gate production and sales data;<br>Data from wholesale and retail outlets   | Market price of tilapia remain stable  |
| <b>Outputs</b><br>1. Increased supply of quality seedstock<br>2. Increased access to markets<br>3. Increased income generated by fish farmers<br>4. Strengthened capacity of extension services | Seed production increased by 50% in three (3) years.<br>90% of hatcheries with percentage male conversion at 98%<br>Three (3) new points of sale opened realizing 20% of sales<br>Net income per production unit increased by 25%.<br>25% of new and existing farmers adopt new production technologies and models.<br>Three (3) training sessions held<br>Nine (9) extension officers trained. | Collection and analysis of production data from tilapia hatcheries<br>Random sampling of hatcheries to determine sex definition of fry.<br>Points of sale constructed.<br>Sales data collected and analysed<br>Sales record from operators<br>Analysis of input costs vs gross earnings<br>Report on survey of production practices<br>Increased production within the expected timeframe for crop.<br>Growth rates are within industry standards of 2 - 3g/dy.<br>Improved production records<br>Register and reports from workshops.<br>Continuous education accreditation developed and implemented | 1. Policy support for Aquaculture development remains intact<br>2. Natural disasters does not negatively affect the industry's infrastructure<br>3. Pending government modernizing of the public sector does not entail the staff cuts at the Aquaculture Branch |

## Proposed Outcomes to Date

- Rethink production model  
(Intermediary producers)
- Increase stocking size
- Education

## End Result of the Project

- Increased Tilapia Production
- Increased RD
- Increased income for fish farmers
- Good quality product available
- Increased food security

## Conclusion

- Governmental support is essential  
(Policy support)
- Marketing

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| <b>Project Purpose:</b><br>Increase consumption of locally produced tilapia   | Consumption of tilapia increased by 25%.  | Farm gate production and sales data; Data from wholesale and retail outlets   | Market price of tilapia remain stable   |
| <b>Outputs</b> <ol style="list-style-type: none"> <li>Increased supply of quality seedstock</li> <li>Increased access to markets</li> <li>Increased income generated by fish farmers</li> </ol> | Seed production increased by 50% in three (3) years.<br><br>90% of hatcheries with percentage male conversion at 98%<br>Three (3) new points of sale opened realizing 20% of sales<br><br>Net income per production unit increased by 25%.<br><br>25% of new and existing farmers adopt | Collection and analysis of production data from tilapia hatcheries<br><br>Random sampling of hatcheries to determine sex definition of fry.<br><br>Points of sale constructed.<br>Sales data collected and analysed | <ol style="list-style-type: none"> <li>Policy support for Aquaculture development remains intact</li> <li>Natural disasters does not negatively affect the industry's infrastructure</li> <li>Pending government</li> </ol> |

|   |  |   |  |
|---|--|---|--|
| <p>4. Strengthened capacity of extension services</p> | <p>new production technologies and models.</p> <p>Three (3) training sessions held</p> <p>Nine (9) extension officers trained.</p> | <p>Sales record from operators</p> <p>Analysis of input costs vs gross earnings</p> <p>Report on survey of production practices</p> <p>Increased production within the expected timeframe for crop.</p> <p>Growth rates are within industry standards of 2 - 3g/dy.</p> <p>Improved production records</p> <p>Register and reports from workshops.</p> <p>Continuous education accreditation developed and implemented.</p> | <p>modernizing of the public sector does not entail the staff cuts at the Aquaculture Branch</p> |
|---|--|---|--|

| Activities   | Inputs  |  |   |  |
|--|---|--|---|--|
|  | Donor Agency  | Jamaican Side  | Budget  |  |
| 1.1 Rehabilitate hatchery infrastructure<br>1.2 Rehabilitate production units<br>1.3 Acquire new broodstock<br>1.4 Develop broodstock management programme<br>1.5 Hire and train staff in hatchery production technologies<br>1.6 Procure appropriate delivery apparatus and vehicles<br>1.7 Develop private/public partnership for ongrowing of advanced fry to 40g fingerlings<br>1.8 Identify farmer group for ongrowing<br>1.9 Assess farmer group capacity<br>1.10 Train farmer group in fry and fingerling management<br>1.11 Replicate fingerling production model to farmer grouping/geographic area | <b>Personnel:</b><br>Seed production, marketing, extension and rural development specialist, Project manager<br><br><b>Equipment:</b><br>Vehicle for seed delivery, live haul box and accessories, pharmaceuticals, aeration devices, netting, standby generator, feed, laptop, data analysis software, projector, projector screens<br><br><b>Cost:</b><br>Project Management Cost, Expert salaries, Hatchery and pond rehabilitation,<br><br><b>Other:</b><br>Broodstock, feed Equipment , market survey, promotional | <b>Personnel:</b><br>Staff from the Aquaculture Branch (R&D and Extension)<br><br><b>Facilities:</b><br>Office space, hatcheries and pond space<br><br><b>Operational Costs:</b><br>Fuel for vehicle, salary and allowance for local staff, security,<br><br><b>Contracts:</b><br>earth moving equipment, rehabilitation of hatchery | Project manager \$6M, \$720,000 allowances<br>Other specialists \$4M each, 420,000 in upkeep allowance<br><br>Equipment and Materials<br><br>2 Vehicle \$8M, livehaul box US\$10,000; pharmaceuticals US\$5,000; 5 blowers - US\$50,000; standby generator \$4M; laptop US\$1,500; data analysis software US\$15,000, 2 Ozone filter - US\$4,000; compound and binocular microscope - US\$ , water quality kits US\$ xx; 9 data phones \$270,000.00<br><br>Travelling and subsistence for extension officers, \$10.5M | The New Fisheries Laws and Regulations are enacted |



|  |   |  |                                |  |
|--|---|--|--------------------------------|--|
|  | campaign, development of retail outlet; procure equipment and supplies for retail outlets |  | Tilapia ration<br>\$312,000.00 |  |
| 2.1 Conduct comprehensive market analysis and promotion study<br>2.2 Identify areas for targeting marketing activities<br>2.3 Develop promotional campaign for select public sector and private sector areas<br>2.4 Implement campaign<br>2.5 Create retail outlets for tilapia products<br>2.6 Monitor retail outlets   |   |  |                                |  |
| 3.1 Design comparative studies (fingerling vs advanced fry, feed comparison studies at all growth stages, comparative cost analysis,<br>3.2 Conduct analysis and prepare reports on studies.   |   |  |                                |  |
| 4.1 Assess the capacity of extension services to effectively transfer and monitor production technology<br>4.2 Identify critical gaps<br>4.3 Develop targeted extension programme to transfer technology on seedstock production, grow-out methodologies and advise farmers on marketing trends<br>4.4 Develop training programme in production management for farmers.<br>4.5 Procure basic field monitoring equipment<br>4.6 Design and implement field monitoring and |   |  |                                |  |

|   |  |  |   |
|---|--|--|---|
| data collection programme<br>4.7 Extension service monitor and provide advice to farmers on production models and efficiency        |  |  |   |
| 5.1. Form small-scale aquaculture group<br>5.2 Train group in group formation, group dynamics, fund raising and project formulation |  |  | <b>Per-Conditions:</b><br>1. <b>Policy makers</b> sees the project as a priority and support accordingly<br><br>2. Target groups accept the Project |

## **Suriname Progress Report**

After the First Regional Aquaculture Workshop, the proposed actions have been used to prepare the national aquaculture development plan for 2011-2015. These actions have been processed into a so called “white paper” to be used as the basis for aquaculture development in Suriname.

The projects that were agreed upon during the first regional workshop were:

1. Lowering the cost of exploitation
2. Rehabilitation of aquaculture farms
3. Zoning plan
4. Aquaculture research and training center
5. Aquaculture handbook

This white paper has been discussed in various stakeholder meetings, the last on a national level, and the various inputs and criticisms from the sector have been discussed until the document is one which both the ministry and the stakeholders agree upon. According to the input of the sector it has been decided that the rehabilitation of aquaculture farms, which at the moment is not realistic, would be taken out and the monitoring of mercury contamination in Surinamese rivers would be added.

The completion of this phase of the process has been concluded in July 2011. The details such as determination of exact operational cost to be proposed for funding and detailed timeline/plan of operations are currently taking place.

The biggest problem that is encountered during the process is that since May 2011 till now, the aquaculture department consists of one (1) person. This has been brought to the attention of the responsible parties and it is expected that there will be one (1) more employee by October 2011. Due to the lack of personnel and the amount of work coming in, the action plan and other projects encounter serious delays.

Another problem is that some information is not centralized and it is not always known where the information can be found and/or is available.

### **I. Lower the cost of exploitation**

Aquaculture has great potential, but the biggest cost that this sector faces is the high cost of exploitation. The main costs that have been identified are; labor, energy and feed. Of these inputs, feed is the highest cost factor in production. Reduction of these costs will greatly improve the competitiveness of aquaculture products on the market. The most viable option for reduction of the cost of feed is the local production of feed components.

#### **Who will do it**

The Ministry of Agriculture in collaboration with the University of Suriname and international research institutions.

#### **When will it be done**

The first phase of information gathering has already started.

### **Production objectives**

The reduction of the cost of feed will have a direct impact on the exploitation costs of aquaculture and will lead to an increase of aquaculture production for local and international markets. The proposal of local production of feed components will have an impact across the entire agriculture sector (aquaculture, agriculture and animal husbandry).

### **How will it be done**

A working group will be established to focus primarily on the feed component in agriculture. Several options for production of alternative feed have already been identified and viability of these methods needs to be verified. This working group will consist of several experts from the different departments of the Ministry of Agriculture as well as several stakeholders.

## **II. Mercury contamination in Surinamese waters**

Aquaculture in Suriname has great potential. The climate and availability of water are all advantages for this sector, but the safety of cultivated fish and/or shrimp should be taken into consideration. Small scale gold mining operations, in which mercury is heavily used, is the primary cause of mercury contamination in the rivers. Therefore it is imperative that areas/zones destined for aquaculture have the availability of clean water and do not present any mercury contamination. From this point of view, the inventory of mercury contamination in Surinamese rivers is important, to avoid the exploitation of aquaculture for consumption in these areas/zones.

### **Who will do it**

The Ministry of Agriculture, Animal Husbandry and Fisheries, in collaboration with local research facilities, the Ministry of Public Health and the PAHO.

### **Where will it be done**

The location for this research is not restricted to a particular area. It deals with the occurrence and amount of mercury contamination in rivers and lakes across Suriname.

### **When will it be done**

The first steps for this project are already being undertaken. Currently the stock-taking of information is taking place in order to centralize all of the information available on mercury contamination. The next step will be to categorize and organize the information relevant to the aquaculture sector. This information will also be utilized in drawing up the zoning plans for aquaculture purposes to ensure that the farmed fish and/or shrimp do not pose a public health risk and is safe for human consumption.

### **Production objectives**

With the help of this information the zoning plans for aquaculture will be established and/or adjusted. This research will also serve as a baseline for further periodic research into mercury contamination in Surinamese waters. In the case of production of food fish the mercury contamination can pose a serious risk for public health, where in the case of cultivation of ornamental fish the mercury contamination is of less importance.

### **How will it be done**

In collaboration with different research facilities, the ministry of public health and other stakeholders led by the PAHO there is currently a stock-taking of all available information on the occurrence of mercury

contamination in Suriname (land, water and air). With the centralization of this information a better understanding of the level of mercury contamination and its implications on aquaculture and fisheries in Suriname as well as its implications and risks for public health in these areas.

The analysis will be done by the ministry. A team will take samples in the major rivers in Suriname and these locations will be registered. The analysis will be done in collaboration with the fish inspection institute (VKI).

### **III. Zoning for aquaculture**

Except for the fact that areas used for aquaculture need to be free of mercury contamination, caution is also advised to prevent the utilization of these areas for purposes other than aquaculture (e.g. house construction) that can cause conflicts between the activities. Aquaculture cannot be done in rural areas (contamination of water through waste and sewage) or in agriculture areas (contamination through the use of pesticides). Implementation of these zones is also important to be able to farms fish/shrimp that do not pose a threat to public health.

#### **Who will do it**

Ministry of Agriculture, Animal Husbandry and Fisheries, in collaboration with the ministries and institutions responsible for land.

#### **When will it be done**

There have been concepts drafted up in the past. These need to be revised and approved. The goal is to have them implemented in 2012.

#### **Production Goals**

Areas destined for aquaculture should not be used for other purposes (e.g. house building, agriculture, etc.).

#### **How will it be done**

The different areas and their destinations have been identified in the past. This needs to be checked on its validity and revised if necessary before approval. The zoning needs to be implemented as soon as possible to prevent utilization of these areas for other purposes.

### **IV. Research and training center**

One cannot do aquaculture without knowledge of the fish/shrimp to be cultivated and their cultivation systems. The main purpose of this center is guidance, through extension officers, of the aquaculture entrepreneur, students and other interested parties. This guidance will be given from the planning to the implementation phase and harvest of the product. This way the farms can be guided from the beginning to comply with the minimal international standards (e.g. globalGAP) and is able to guarantee a quality product. This way, in the case of future expansion there need not be unnecessary costs to comply with certification. Another goal of this center is to educate interested parties in the basics of entrepreneurship and minimize the risk of failure because of bad management of new aquaculture ventures.

**Who will do it**

This project was to be done in collaboration with the FAO. The technical expertise needed for this project would be provided by the FAO. And it would be partly financed by the FAO. The rest would be funded by the Surinamese Government. The current perspectives are that this project will be done in collaboration with China.

**Where will it be done**

The location that was chosen was Oryza, Uitkijk, in the district of Saramacca. This location can currently not be used. Possibilities to change the location to COMAS in the Commewijne district are being revised.

**When will it be done**

The goal is to start this project in 2012.

**Production goals**

This center has the following main goals:

The production of fingerlings and fry for aquaculture, especially the small scale aquaculture.

Providing training to individuals interested in aquaculture.

Guidance of aquaculture ventures from beginning up until the production phase.

Develop or adjust cultivation methods to Surinamese conditions, in order to achieve diversification of aquaculture products.

In collaboration with foreign research centers (e.g. Brazil) cultivation systems will be adapted to Surinamese conditions. The collaboration has another purpose, which is the prevention of wasting funds for research into species and cultivation systems that has already been done by institutions (double research). Pilot projects for cultivation of “new species” will also be done at the center in collaboration with aquaculture farms to reduce the risk of financial losses due to unforeseen problems. Guidance and monitoring of aquaculture farms will also be part of the responsibilities of the center.

**How will it be done**

The former location of this project was identified and approved by the FAO. However, the location for this project will be changed to the district Commewijne. The location that has been mentioned on various occasions is COMAS.

**V. Aquaculture handbook**

The cultivation of fish/shrimp for which there is a demand, is the main goal of every aquaculture farm. In the research and training center attention shall also be given to the research of local species of interest to aquaculture and cultivation systems for Surinamese conditions. The goal is to achieve diversification of aquaculture production to other species than the traditional ones to be produced for the local and/or international market. Due to the decline of catches, this handbook will also include methods cultivation of commercial fish species for restocking purposes.

**Who will do it**

This project will be done in collaboration with the University of Suriname and other international research institutions (primarily in South America and the Caribbean).

**When will it be done**

The first phase has already started and currently it has already been evident that information on biology, reproduction, etc of local species of interest to aquaculture is lacking.

**Production goals**

Set up a database in which local species of interest for aquaculture and their cultivation methods are registered. The primary goal of this project is to achieve diversification of aquaculture products as well as cultivating species for restocking purposes. The cultivation of ornamental fish shall also be included.

**How will it be done**

In collaboration with the University of Suriname, ADEKUS, a literature study is being done into the commercially interesting species for aquaculture. The lack of information that has already been identified will be addressed by collaborating with international research institutions that have already done research in these species. In the case that the information is not available, there will be a collaboration with the University to do this research (possibly by students) to be able to fill this gap.

The next step will be to identify cultivation methods for these species that can be used for Surinamese conditions. Once these methods have been identified, pilot projects should be done for implementation of these methods

The species that are being considered are freshwater-, brackish water- and ornamental fish. In a later stage the cultivation of marine species may be included.

**Who will benefit**

Aquaculture farms interested in the cultivation of non-traditional fish species and ornamental fish. The fisheries sector as well as the aquaculture sector.

## **Trinidad and Tobago Action Plans**

### **Tilapia Commodity Action Plan**

Tilapia was chosen as a priority commodity for food security and export competitiveness. Applying specific selection criteria for food security Tilapia was weighted at 68% which placed it in the range for commodities to be prioritized for the food security development plan.

The total production of fish from capture fisheries in Trinidad and Tobago ranges on average between 13,000 to 15,000 metric tonnes. There are also significant imports of fish and fishery products, in particular Tilapia, which suggests that production needs to be enhanced towards possibly replacing the quantities of imported supplies and contribute towards enhancing food security. The overfished status of many marine stocks suggests that any increased production from the marine sector can only be realized through judicious management and even so may be minimal. The best that may be accomplished is sustainability of the marine fisheries resources. With the move towards healthier life styles which is promoting increased consumption of fish, primary potential to increase availability is projected to be through increased production in the aquaculture sector.

Current tilapia production is about 1000 lbs per week and increasing. Members of the association aQua-TT are producing 10,000 lbs per year with the potential to produce 100,000 lbs per year which the local market will absorb. The Tilapia Growers Association (TGA) now produces 500 lbs per week. There is significant unused capacity with a projected output of 150,000 lbs per annum after an eight (8) month startup period. A production target of 200,000 lbs per year with an incremental production over the next 5 years to 2 million lbs per year is proposed, once an accelerated marketing and promotional campaign is in place, systems can be expanded to produce more. The processing sector also needs to be enhanced to produce fresh chilled or frozen Tilapia fillets and other value added products.

### **Over all Target - To develop a sustainable aquaculture subsector and increase the production of tilapia to 2 million pounds over a five (5) year period.**

Major strategies to be employed for achieving the objectives are:

Increasing the production of fingerlings by bringing existing hatcheries into full production, reducing input costs through implementation of a new package of aquaculture incentives directed at enhancing production, promoting research on feeds to further reduce feeds costs at all stages in tilapia life cycle, reducing or eliminating certain duties or taxes, encouraging application of appropriate standards in production, designing and implementing an aggressive tilapia promotional and marketing campaign and establishing a tilapia processing and cold storage facility.

Strategies will also deal with enhancing the human resources capability for delivering quality extension services by institutional strengthening within the Fisheries Division MFPLMA. In addition, training for various levels of involvement in the sector will be enhanced to ensure that there is skilled labour for working on aquaculture enterprises.



A major impediment to progress in the sector relates to financing and access to appropriate funding for aquaculture ventures. A number of demonstration systems will be established with the aim of producing background information for business modeling as well as to provide for supervised training and appreciation of the realities of aquaculture for prospective farmers and agencies which provide services or funding for aquaculture. Appropriate technical packages will also be developed.

The organisation of the sector will also be addressed through establishment of appropriate databases of registered enterprises and individuals, communication strategies inclusive of stakeholder involvement and feedback mechanisms; and above all the elaboration of policies to govern development and operations in the sector inclusive of appropriate land use and water policies. In addition, mechanisms for diagnostic testing and pathological evaluations will be streamlined accordingly.

Agencies involved in the development of the commodity include the Fisheries Division and the Sea Food Industry Development Company, MFPLMA; aQua-TT, Tilapia Growers Association, Institute of Marine Affairs, University of the West Indies and the Sugar Cane Feeds Centre.

## Aquaculture Action Plan

| Acronym        | Organisation/Office Full name                          | Acronym      | Organisation/Office Full name                       |
|----------------|--|--------------|---|
| <b>ADB</b>     | Agricultural Development Bank                          | <b>NFM</b>   | National Flour Mills                                |
| <b>ADSC</b>    | Aquaculture Development Steering Committee             | <b>NTA</b>   | National Training Agency                            |
| <b>aQua-TT</b> | Aquaculture Association of Trinidad and Tobago         | <b>NVQ</b>   | National Vocational Qualification                   |
| <b>BDC</b>     | Business Development Company Ltd.                      | <b>PS</b>    | Permanent Secretary, MFPLMA                         |
| <b>C&amp;E</b> | Customs and Excise Division                            | <b>RD</b>    | Research Division                                   |
| <b>CFTDI</b>   | Caribbean Fisheries Training and Development Institute | <b>SFC</b>   | Sugarcane Feeds Centre                              |
| <b>COSL</b>    | Commissioner of State Lands                            | <b>SIDC</b>  | Seafood Industry Development Company Limited        |
| <b>FD</b>      | Fisheries Division                                     | <b>TGA</b>   | Tilapia Growers Association                         |
| <b>GAAS</b>    | Global Aquaculture Alliance Standards                  | <b>TOR</b>   | Terms of Reference                                  |
| <b>GMP</b>     | Guaranteed Market Price                                | <b>UTT</b>   | University of Trinidad and Tobago                   |
| <b>HM</b>      | Honourable Minister, MFPLMA                            | <b>UWI</b>   | The University of the West Indies                   |
| <b>IMA</b>     | Institute of Marine Affairs                            | <b>VAT</b>   | Value Added Tax                                     |
| <b>MFPLMA</b>  | Ministry of Food Production, Land & Marine Affairs     | <b>YTEPP</b> | Youth Training and Employment Partnership Programme |
| <b>MSTTE</b>   | Ministry of Science, Technology and Tertiary Education |              |   |
| <b>MTI</b>     | Ministry of Trade and Industry                         |              |   |

# Action Plan Matrix – Aquaculture

## INTRODUCTION

The total production of fish from capture fisheries in Trinidad and Tobago ranges on average between 13,000 to 15,000 metric tonnes. There are also significant imports of fish and fishery products, in particular Tilapia, which suggests that production needs to be enhanced. Further, fish consumption in Trinidad and Tobago stands at 6.6% per capita which is the lowest among CARICOM countries. With the move towards healthier life styles and increased consumption of fish, there is potential to increase availability through increased production in the aquaculture sector. Current tilapia Production is about 1000 lbs per week and increasing. Members of the aQua-TT are producing 10,000 lbs per year with the potential to produce 100,000 lbs per year which the local market will absorb. The Tilapia Growers Association (TGA) now produces 500 lbs per week. There is significant unused capacity with a projected output of 150,000 lbs pr year after an eight (8) month startup. A production target of 200,000 lbs per year with an incremental production over the next 5 years to 2 million lbs per year is proposed, once an accelerated marketing and promotional campaign is in place, systems can be expanded to produce more. The processing sector also needs to be enhanced to produce fresh chilled or frozen Tilapia fillets and other value added products.

Over all Target - To develop a sustainable aquaculture subsector and increase the production of tilapia to 2 million pounds over a five (5) year period.

### Imports -

Local Production – 21,463 lbs

Target Production – 2 million lbs (over 5 yrs)

| Target /Objectives  | Strategies / Major Actions   | Activities  | Resources | Time in Years | Responsible Division/Agency to initiate objective | Impacts/Remarks   |
|---|--|---|-----------|---------------|---|---|
| 1.0 Reduce the cost of importation of gear, equipment and components for aquaculture. | <ul style="list-style-type: none"><li>Institute measures which will reduce or eliminate the Import Duties and VAT on items specific to aquaculture, similar to what already exists for the agriculture and marine fishery sectors.</li></ul> | <ul style="list-style-type: none"><li>List of items to be prepared by TGA and aQua-TT in collaboration with FD.</li></ul> |           | 1             | FD Planning Division.                             | The cost of importing equipment, gear and components for the aquaculture subsector is very high. Reducing or eliminating Duties and VAT on these items will decrease overall costs and farmers will be encouraged to invest in essential and supportive technology to |



| Target /Objectives   | Strategies / Major Actions  | Activities   | Resources | Time in Years | Responsible Division/Agency to initiate objective      | Impacts/Remarks  |
|--|---|--|-----------|---------------|--|--|
|  | <ul style="list-style-type: none"> <li>Establish reasons for failure of aquaculture operations and put mitigating measures in place for start-up and continuation of ventures with a supportive system/enabling framework.</li> </ul> | <ul style="list-style-type: none"> <li>List ,chosed and prioritize projects for start up and rehabilitation of aquaculture ventures</li> </ul>   |           |               |  | <p>to inefficiencies which training and demonstration will address.</p> <p>Maximize use of existing infrastructure and enhance public-private sector partnerships to demonstrate successes and best practices in the sector.</p> |
| <b>3.0</b> To foster and encourage the adoption of best practices in aquaculture operations. | <ul style="list-style-type: none"> <li>Encourage the adoption and application of the Global Aquaculture Alliance Standards.</li> </ul>  | <ul style="list-style-type: none"> <li>Conduct farmer training to enhance knowledge and use of the GAAS.</li> <li>Develop information and educational material on the GAAS.</li> </ul> |           | 1-5           | <ul style="list-style-type: none"> <li>SIDC</li> </ul> | This will facilitate market acceptance and make obtaining HACCP certification and international recognition easier.  |

| Target /Objectives  | Strategies / Major Actions  | Activities   | Resources | Time in Years | Responsible Division/Agency to initiate objective                 | Impacts/Remarks   |
|---|---|--|-----------|---------------|---|---|
| <b>4.0</b> Greater efficiency with respect to procedures for establishing aquaculture operations.                               | <ul style="list-style-type: none"> <li>Environmental requirements for establishing aquaculture operations specified and promoted.</li> </ul>  | <ul style="list-style-type: none"> <li>Initiate discussions with EMA in collaboration with stakeholders to review the existing guidelines and agree on requirements which are practical and achievable.</li> <li></li> </ul>   |           | 1-2           | <ul style="list-style-type: none"> <li>SIDC</li> </ul>            | Guidelines, recommendations and requirements by EMA will be more practical for aquaculture enterprises.   |
| <b>5.0</b> Reduced costs for pipe borne water used in re-circulating aquaculture systems.                                       | <ul style="list-style-type: none"> <li>Establish a policy on water for aquaculture.</li> </ul>  | <ul style="list-style-type: none"> <li>Initiate discussions with WASA to establish a policy or guideline on pipe borne water for aquaculture re-circulating systems.</li> </ul>  |           | 1-2           | <ul style="list-style-type: none"> <li>FD</li> </ul>              | Enhanced awareness by prospective aquaculturists of cost involved and other responsibilities with respect to use of water for aquaculture.  |
| <b>6.0</b> An approved policy for Aquaculture Development   | <ul style="list-style-type: none"> <li>.To revise and update draft policies.</li> </ul>   | <ul style="list-style-type: none"> <li>Appoint a committee to review existing draft policies to update and amend for approval</li> </ul>   |           | 2-3           | <ul style="list-style-type: none"> <li>FD</li> </ul>              | There is no approved Policy on aquaculture. Investors require information on what Government Policies are in place regarding aquaculture so they can make decisions accordingly.          |
| <b>7.0</b> An efficient and effective network to disseminate up to date information to existing and prospective aquaculturists. | <ul style="list-style-type: none"> <li>To establish production systems and systematically field test to produce data on production systems for use by investors and farmers.</li> <li>Establish formal networks for information dissemination.</li> </ul> | <ul style="list-style-type: none"> <li>Establish systems at all levels (small, medium and large) to generate information to guide investment in the sector.</li> <li>Where systems already exist, collate relevant data for dissemination to existing and</li> </ul> |           | 1-5           | <ul style="list-style-type: none"> <li>IMA</li> <li>FD</li> </ul> | The promotion of several production systems without essential and necessary data can be confusing to farmers. If specific data is available, investors and farmers can make more informed |

| Target /Objectives  | Strategies / Major Actions   | Activities   | Resources | Time in Years | Responsible Division/Agency to initiate objective                      | Impacts/Remarks  |
|---|--|--|-----------|---------------|--|--|
|   | <ul style="list-style-type: none"> <li>Widen the scope of R&amp;D to cover more systems which are relevant to farmers and investors.</li> </ul>  | prospective aquaculturists.  |           |               |  | decisions and better plan business operations.   |
| <b>8.0</b> Create and maintain data base of trained aquaculture technicians.          | <ul style="list-style-type: none"> <li>Identify and make available a database of appropriately trained/skilled persons who are suitable for employment on aquaculture operations.</li> </ul> | <ul style="list-style-type: none"> <li>A list of trained persons will be requested from the MSTTE and made available to the TGA and aQua-TT.</li> </ul>  |           | 1-5           | <ul style="list-style-type: none"> <li>FD</li> <li>MSTTE</li> </ul>    | <p>This will reduce the difficulty in identifying and accessing appropriately trained/skilled labour for employment on farms and for extension services.</p> <p>The National Training Agency has developed standards (in collaboration with stakeholders) for training providers (UTT, YTEPP), leading to National Vocational Qualification (NVQ).</p> |
| <b>9.0</b> Establishment of a favorable investment climate for aquaculture activities | <ul style="list-style-type: none"> <li>Aquaculture stakeholders to collaborate with financial institutions to strengthen and streamline relationships.</li> </ul>                            | <ul style="list-style-type: none"> <li>Strengthen the relationship between the ADB &amp; BDC</li> <li>ADB to meet with farmers groups.</li> <li>Farmers groups to continue to collaborate with ADB.</li> </ul> |           | 1-5           | <ul style="list-style-type: none"> <li>aQua-tt</li> <li>TGA</li> </ul> | <p>Collateral requirements are somewhat demanding.</p> <p>There is the need to enhance knowledge and information of the industry for financial institutions to reduce the time-lags for processing loans.</p>  |

| Target /Objectives   | Strategies / Major Actions  | Activities  | Resources | Time in Years | Responsible Division/Agency to initiate objective   | Impacts/Remarks  |
|--|---|---|-----------|---------------|---|--|
|  |   |   |           |               |   | Improve networking amongst the ADB and other relevant agencies.  |
| <b>10.0</b> To make suitable high quality feeds at reasonable costs available for aquaculture. | <ul style="list-style-type: none"> <li>To increase the availability of locally produced high quality feeds for various stages of farmed Tilapia.</li> </ul> | <ul style="list-style-type: none"> <li>Enter into discussions with NFM to either:</li> <li>Import feed with a guaranteed nutrient profile for each developmental stage; or Produce feed with a guaranteed nutrient profile for each developmental stage</li> <li>Provide a subsidy for feed as an interim measure, similar to what has been instituted for the Livestock Sector.</li> </ul> |           | 1-2           | <ul style="list-style-type: none"> <li>SIDC</li> <li>aQua-TT</li> <li>TGA</li> </ul>                          | Feed costs account for approximately 60% to 80% of revenue expenditure on aquaculture operations. Subsidized feed will lower the farmers' cost of production during the developmental stages of the aquaculture subsector. |
|  | <ul style="list-style-type: none"> <li>Minimize or eliminate potential competition between state agencies and farmers who import feed.</li> </ul>           | <ul style="list-style-type: none"> <li>Establish MOU between agencies and farmers who import feed.</li> </ul>   |           | 1             | <ul style="list-style-type: none"> <li>SIDC</li> </ul>  | Reduced uncertainty where farmer's investments are concerned.  |
| <b>11.0</b> To create and maintain data base of hatcheries and farmers                         | <ul style="list-style-type: none"> <li>Incorporate hatchery and farmer information into the database.</li> </ul>  | <ul style="list-style-type: none"> <li>To establish database of seed stock requirement and production.</li> <li>Establish MOU between agencies and farmers who produce fingerlings.</li> </ul>  |           | 1-2           | <ul style="list-style-type: none"> <li>FD</li> <li>TGA</li> <li>aQua-TT</li> <li>SIDC</li> <li>IMA</li> </ul> | There is insufficient data on seed stock production and existing hatcheries are apparently operating under capacity. Capital cost of establishing  |



| Target /Objectives   | Strategies / Major Actions   | Activities   | Resources | Time in Years | Responsible Division/Agency to initiate objective                            | Impacts/Remarks  |
|--|--|--|-----------|---------------|--|--|
|  |  |  |           |               |  | hatcheries and cost of fingerling production are relatively high so efforts should be made to maximize the potential of existing hatcheries.   |
| <b>12.0</b> To make aquatic veterinary services affordable to aquaculturists.                                    | <ul style="list-style-type: none"> <li>Services for aquaculturists could be offered at reduced costs.</li> </ul>   | <ul style="list-style-type: none"> <li>Develop MOU with School of Veterinary Medicine.</li> </ul>  |           | 1             | <ul style="list-style-type: none"> <li>SIDC</li> <li>UWI</li> </ul>          | Aquatic veterinary services are available but at a cost and could be a deterrent in farmers seeking such assistance.   |
| <b>13.0</b> Establishment of a Model Farm by Fisheries Division to promote and mobilize aquaculture development. | <ul style="list-style-type: none"> <li>Fisheries Division to establish model farm for training, testing and demonstration of a range of systems which has potential for T&amp;T.</li> <li>Identify property to be acquired for the establishment and development of model farm for training, testing, and demonstrating facilities.</li> </ul> | <ul style="list-style-type: none"> <li>Acquire appropriate property to establish and develop a model farm.</li> <li>Develop plans and proposals for managing and operating model farm.</li> <li>Construct model farm.</li> </ul> |           | 1-2           | <ul style="list-style-type: none"> <li>HM</li> <li>PS</li> <li>FD</li> </ul> | <p>With facilities of its own, the FD can better carry out its mandate and conduct farmer training, field testing of models and establish demonstration units.</p> <p>This initiative is being pursued by the PS and FD.</p> |

| Target /Objectives   | Strategies / Major Actions   | Activities  | Resources   | Time in Years | Responsible Division/Agency to initiate objective      | Impacts/Remarks   |
|--|--|---|---|---------------|--|---|
| <b>14.0</b> To establish a processing plant and marketing plan for farmed Tilapia. | <ul style="list-style-type: none"> <li>Allow the market to develop momentum and achieve consistent and frequent volumes of a quality product for the local, regional and international markets.</li> </ul> | <ul style="list-style-type: none"> <li>Identify State Agency to develop capacity to process tilapia and conduct value added marketing trials</li> </ul> | <ul style="list-style-type: none"> <li>SIDC has capability and resources to be able to carry out this mandate.</li> <li>It has already developed designs for a processing plant. SIDC also has suitable space, electricity and water supply which are available for establishing a processing unit.</li> <li>Estimated cost for establishing the processing plant is \$1.741 million. Operational costs are expected to be \$944,340 per year.</li> </ul> | 1-5           | <ul style="list-style-type: none"> <li>SIDC</li> </ul> | <ul style="list-style-type: none"> <li>A recognized and established agency should be given the responsibility to carry out this function to prevent abuse or misuse of the initiative. The agency should have capability to institute grading, quality assurance programmes and processing when necessary.</li> </ul> |

| Target /Objectives                                     | Strategies / Major Actions  | Activities | Resources | Time in Years | Responsible Division/Agency to initiate objective      | Impacts/Remarks  |
|--|---|------------|-----------|---------------|--|--|
| <b>15.0</b> To launch a national promotional campaign. | <ul style="list-style-type: none"> <li>A national promotional campaign to be undertaken to increase awareness of Tilapia and increase per capita consumption of fish from <u>16 lbs to 17 lbs</u>, with the increase being fulfilled by Tilapia.</li> </ul> |            |           | 1-2           | <ul style="list-style-type: none"> <li>SIDC</li> </ul> | <p>Discussions about a general national awareness campaign to raise public knowledge and education about tilapia to be initiated.</p> <p>This will serve to make consumers aware of the product, benefits, virtues, etc. and stimulate market acceptance and growth.</p> |

## Appendix 4: Report of Field Trip

Prepared by Miguel Sosa

Day 2 of the workshop took the form of a field trip so that participants would get a first-hand look at the progress made under the “Jamaica Training and Extension of Small Scale Fish Culture” project. It was intended that the group would visit three small scale tilapia farmers that were participating in this project.

The first farm visited was that of Mr. Lambert Kase. Mr. Kase operated a total of 6 ponds on his farm in Cave Valley. This fish farm had been in operation for several years but due to the constraints of the tilapia industry that Jamaica has experienced over the past years Mr. Kase decided to cease operations in his tilapia ponds and continue his other agricultural activities which are cattle ranching and crops.

The CRFM/JICA Small Scale Tilapia Farmers project then approached Mr. Kase and proposed to him that he continue tilapia production on his farm with the technical and financial assistance with which the project could support him. In actuality the Project has been working with four (4) tilapia farmer clusters throughout the country and Mr. Kase is one farmer in one of these clusters. The project is assisting all these farmers with better farming methods and marketing practices with the intention of revitalizing the sector. It is hoped that after the completion of the pilot project, the Ministry of Agriculture and Fisheries can continue to provide this kind of technical support to farmers.

The workgroup observed four active ponds on the farm. The tilapias had been stocked three months earlier. The average biomass of fingerlings at stocking was 0.37 grams. The stocking density has been kept low (2.6/m<sup>2</sup>) to promote growth and survival. The ponds are fertilized with chicken manure and cow manure. Mr. Kase intends to sell his harvested tilapias at the market place in Brownville. The commercial size for tilapia is ½ lb. and the average selling price is JD \$250 or about US\$3.00. (US\$1 = JD\$80)

The average weight of the tilapias is 101 grams and they are feed a commercial feed with 25% P.C. During the grow-out phase great attention has been placed on security on the farm. Birds and robbers are a threat to fish farmers in the countryside.



**Figure No. 1. Interview with tilapia farmer in Cave Valley, Jamaica**  
Source: Miguel Sosa



**Figure No. 2. 101g Red Tilapias from CRFM/JICA Small Scale Tilapia farming Extension Project in Jamaica**  
Source: Miguel Sosa

The workgroup then continued its tour of farms involved in the project by travelling to the community of James Hill where they observed the fish farms of the other two farmers in this cluster. Mr. Gordon and Mr. Brown both own small scale fish farms in this community. Mr. Gordon has been assisted by the project with the construction of two additional ponds to the two ponds he previously operated. Mr. Gordon is a fish farmer that was considering ceasing his production of tilapia due to the constraints of the sector but thanks to the efforts of the project he has decided to continue tilapia farming.

Mr. Gordon's ponds were stocked with tilapia fingerlings with an average weight of 7.2 grams. The project technicians also provide extension services to these two fish farmers every 21 days. Mr. Gordon already has market size fishes and has begun to sell his tilapias whole. Customers have started coming to his farm to purchase tilapia. He sells tilapia from his farm at a price of JD\$ 200/lb while he is selling price at the market place is JD\$250. "Fish Fries" are a cultural event in the area and Mr. Gordon reports that sales occur mostly on Fridays and Saturdays when customers hold these gatherings with family and family to dine on fried fish in the comfort of their homes. The workgroup had the opportunity to participate in a "fish fry" right there at the farm and they can confirm that the flavour and texture of the tilapia being produced by the project at James Hill of fine quality.



**Figure No. 3. Pond constructed at James Hill, Jamaica by the CRFM/JICA project.**  
Source: Miguel Sosa




**Figure No. 4. The workgroup interviewing Mr. Gordon at his small scale fish farm**  
Source: Miguel Sosa

On a final note it was observed that tilapia farmers can acquire tilapia fingerlings from the Ministry of Agriculture at a price of JD\$5.00, while the private sector can provide tilapia fingerlings at JD\$15.00. Also, the price of a sack of commercial feed (55 lbs sack) is JD\$1500 and its protein content is 25%. This equates to roughly US\$20.00 per sack.

## Appendix 5 (A): Low cost small-scale Aquaculture Development Pilot Project – Belize

Slide 1



**CRFM & JICA PILOT PROJECT  
IMPLEMENTATION OF ALTERNATIVE  
FEEDS IN TILAPIA FARMING**

Belize Fisheries Department  
Prepared by:  
Rigoberto Quintana  
Miguel Manuel Sosa

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**OUTLINE:**

- 1. Introduction**
- 2. Project Components**
- 3. Project Purpose & Expected Outputs**
- 4. Activities Implemented**
- 5. Results & Recommendations**
- 6. Other On-going Projects**

Slide 3

**INTRODUCTION**

- Small-scale aquaculture: important activity that can contribute significantly in food security and poverty alleviation in the CARICOM Region.
- Study on formulation of Master Plan on Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean
- Pilot projects developed – Belize was selected for the implementation of the 'Low Cost Input Small-scale Aquaculture'

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**INTRODUCTION CONT'**

- Development of this sector has been impeded by the high cost of production inputs and limited technology transfer.
- Project focused on Coastal Communities – fishermen
- JICA/CRFM Project initiated in August, 2010 being implemented by IC Net Ltd in collaboration with the CRFM and the Belize Fisheries Department.

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## PROJECT COMPONENTS

### Four main components:

- ❖ Phase I (September 2010 to February 2011) & II (March to June, 2011): grow-out trials at the Fisheries Department Biscayne Facility with Red Hybrid Sex-reversed Tilapia
- ❖ Two grow-out experimental projects: one small-scale tilapia farmer and other with a group of fishermen from coastal community (on-going)

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## PROJECT PURPOSE & EXPECTED OUTPUTS

### Project Purpose:

- To identify and evaluate the suitability of using low cost input and low cost aquaculture production techniques focused on the reduction of feeding cost for small-scale Tilapia farming.

### Expected Outputs:

1. To evaluate the cost effectiveness of using locally available low cost feed and other low cost aquaculture production techniques compared to the existing techniques which totally rely on the use of commercial feed.
2. To determine the cost structure and profitability of small-scale tilapia farming using locally available low cost feeds and aquaculture techniques.

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## ACTIVITIES IMPLEMENTED

### Fisheries Department Biscayne Seedstock Production Facility: Phase I & II

### Objectives:

- To study the feeding cost between the existing culture techniques and the culture techniques utilizing natural food.
- To study the feeding cost between alternative feeds made of local materials and existing commercial feeds.

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## PHASE I: SEPT. 2010 TO FEB, 2011

### Method of Experiment:

- Eight ponds were prepared and stocked using four diets (Shrimp Feed, Regular Rice Bran, Fermented Rice Bran, Mill Feed)
- Tilapia commercial floating feed was not used due to inconsistent supplies in the local market
- Four ponds were fertilized with chicken manure to improve natural pond productivity during the trial period
- Feed rings and feed trays were introduced to contain feed in one location



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### PHASE I CONT: DATA COLLECTION:

#### Pond Preparation:

- Ponds were drained with dry-out period of two weeks.
- Recommended rates of lime ( $100\text{g}/\text{m}^2$ ) and chicken manure ( $50\text{g}/\text{m}^2$ ) were applied
- Pond filling: 15 cm....30 cm....full level at one week interval (3 weeks)
- Chicken manure applied at a rate of  $20\text{g}/\text{m}^2$  in four ponds during the trial maintain algal blooms between 25-30 cm transparency.
- Water quality parameters were recorded prior to stocking (Temp., pH., D.O., TAN, Alkalinity, Hardness, Transparency).

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#### Pond Preparation Activities:

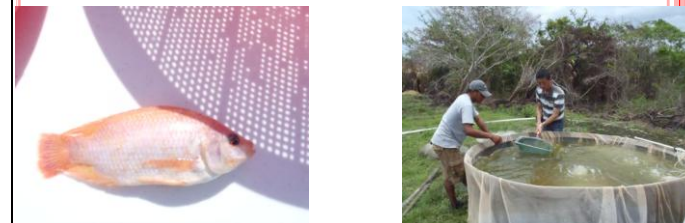


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### PHASE I CONT: DATA COLLECTION:

#### Stocking:

- Ponds were stocked at 5 fingerlings/ $\text{m}^2$  (1-2 grams ABW)
- Fish were counted and total biomass recorded.



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### PHASE I CONT: DATA COLLECTION:

#### Feeding:

- Initial feeding was applied at 10% ABW.
- Feed applied twice daily (7:00 AM.....4:00 PM)
- Feed applied until fish is satiated.
- Daily individual pond feed data was recorded

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### PHASE I CONT: DATA COLLECTION:

#### Pond Monitoring:

- Fish growth was monitored every two weeks to determine the ABW.
  - 100 fish per pond were weighed and the ABW was recorded.
- Daily AM & PM temperatures and D.O. were recorded.
- pH was recorded at every sampling (2 wks).
- Grow-out period of 21 weeks (148 days).

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### PHASE II: MARCH - JUNE, 2011

#### Method of Experiment:

- Same protocol applied as Phase I.
- Period of 17 weeks which was 4 weeks less than Phase I.
- Three types of feeds were introduced:
  - ◊ 50%:50% Shrimp Feed/Fermented Rice Bran;
  - ◊ 50%:50% Fermented Rice Bran/Fermented Mill Feed;
  - ◊ 100% Fermented Mill Feed and other diets included fermented rice bran, regular rice bran and shrimp feed.
- Fertilization of all ponds
- Monthly sampling

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### FERMENTED FEED PREPARATION:

- ❑ Fermented Rice Bran Stock Batch: 20kg R.B. with 2 Kg chicken manure (10:1 ratio), with 3 Kg of water. Ferment for two weeks, must add water after the first week.
- ❑ A portion of the Stock Batch is then used to ferment the Feed Batch. This would be 10 Kg of R.B. with 2 Kg starter R.B. (20:1 ratio), and 3 Kg of water. Ferment this for 5 -7 days.
- ❑ The sacks must be rotated daily to facilitate the fermentation.
- ❑ Similar method used to ferment Mill Feed

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### CONT'

- Mill feed is the by-product of milling wheat.
- It is available in the Belizean market but is not as abundant as Rice Bran.
- Mill feed was fermented in Phase II due to substantial acceptability observed in Phase I.
- Phase II also saw the use of combinations of feeds so as to improve acceptability of the alternative feeds and observe potential differences in growth rates.

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- Fermented Mill Feed & Rice Bran 50/50: 1 Kg starter of M.F. with 1Kg starter R.B. with 5 Kg M.F. and 5 Kg R.B. Also add 3 Kg water.
- Shrimp/Fermented Rice Bran 50/50 is a combination of Shrimp Feed and Fermented Rice Bran. The FRB was fermented separately. They are only mixed together at the time of application. Water is applied to the FRB so that it sinks with the Shrimp Feed.

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### ◦ Rice Bran Fermentation



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### ◦ Rice Bran Fermentation: Dried Chicken Manure



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- Rice Bran Fermentation: Electric 100 lb. cement mixer used



Slide 22

- Rice Bran Fermentation: Mixing of ingredients



Slide 23

## RESULTS:

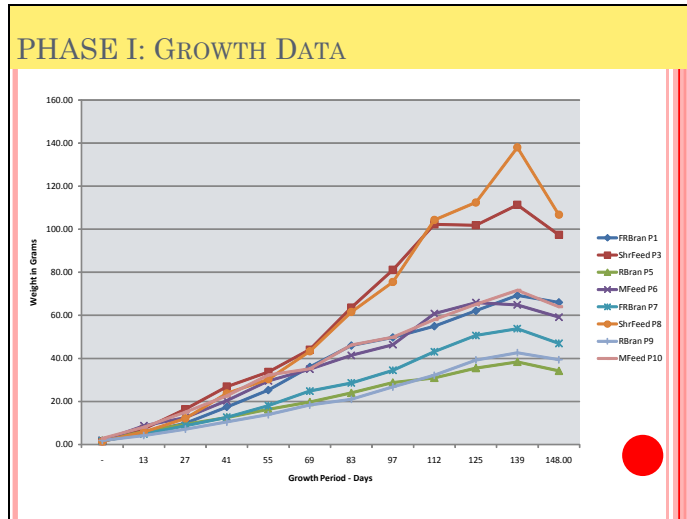
- Data from Phase I and Phase II were dealt with separately.
- Phase I was completed in 148 days
- Phase II was completed in 117 days.
- Both phases consisted of eight (8) test ponds.
- Stocking density remained at 5 fish/m<sup>2</sup> in both phases.
- In Phase I only four diets were applied to two ponds each.
- In Phase II a total of seven diets were used and only Fermented Rice Bran was applied to two ponds.

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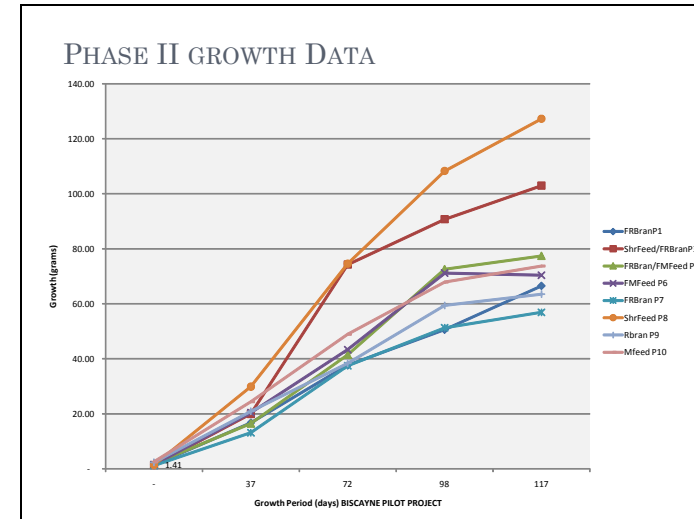
## RESULTS: PHASE I

| Sampling Date | No. Days<br># | Fermented<br>Rice Bran            | Shrimp Feed                       | Rice Bran                         | Mill feed                         | Fermented<br>Rice Bran            | Shrimp Feed                       | Rice Bran                         | Millfeed                           |
|---------------|---------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
|               |               | Pond 1<br>(965 fish)<br>ABW (gr.) | Pond 3<br>(720 fish)<br>ABW (gr.) | Pond 5<br>(695 fish)<br>ABW (gr.) | Pond 6 (785<br>fish)<br>ABW (gr.) | Pond 7<br>(740 fish)<br>ABW (gr.) | Pond 8<br>(935 fish)<br>ABW (gr.) | Pond 9<br>(820 fish)<br>ABW (gr.) | Pond 10<br>(820 fish)<br>ABW (gr.) |
| 07/09/2010    | -             | 1.61                              | 1.50                              | 1.89                              | 1.93                              | 1.69                              | 1.45                              | 1.89                              | 2.86                               |
| 20/09/2010    | 13            | 5.66                              | 7.27                              | 6.02                              | 8.75                              | 4.92                              | 5.80                              | 4.17                              | 8.06                               |
| 04/10/2010    | 27            | 9.86                              | 16.45                             | 9.41                              | 12.57                             | 8.73                              | 12.12                             | 7.16                              | 15.10                              |
| 18/10/2010    | 41            | 17.48                             | 26.92                             | 12.58                             | 20.36                             | 12.69                             | 23.78                             | 10.49                             | 22.58                              |
| 01/11/2010    | 55            | 25.28                             | 33.72                             | 16.37                             | 29.56                             | 18.07                             | 30.31                             | 13.88                             | 32.27                              |
| 15/11/2010    | 69            | 36.02                             | 44.09                             | 19.73                             | 35.01                             | 24.82                             | 43.28                             | 18.35                             | 35.22                              |
| 29/11/2010    | 83            | 45.98                             | 63.63                             | 23.97                             | 41.40                             | 28.63                             | 61.57                             | 21.00                             | 46.29                              |
| 13/12/2010    | 97            | 49.74                             | 81.09                             | 28.76                             | 46.38                             | 34.47                             | 75.50                             | 26.78                             | 49.79                              |
| 28/12/2010    | 112           | 54.97                             | 102.27                            | 30.96                             | 60.81                             | 43.1                              | 104.29                            | 32.15                             | 58.04                              |
| 10/01/2011    | 125           | 62.14                             | 101.86                            | 35.50                             | 65.93                             | 50.68                             | 112.41                            | 39.27                             | 65.14                              |
| 24/01/2011    | 140           | 69.26                             | 111.34                            | 38.39                             | 64.86                             | 53.83                             | 137.98                            | 42.66                             | 71.67                              |
| 02/02/2011    | 148           | 66.03                             | 97.41                             | 34.19                             | 59.19                             | 46.97                             | 106.75                            | 39.38                             | 64.00                              |

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| RESULTS: PHASE II |          |                     |                                   |  |                    |                     |                   |                   |                    |
|-------------------|----------|---------------------|-----------------------------------|--|--------------------|---------------------|-------------------|-------------------|--------------------|
|                   |          | Fermented Rice Bran | Shrimp Feed / Fermented Rice Bran | Fermented Rice Bran / Fermented Millfeed | Fermented Millfeed | Fermented Rice Bran | Shrimp Feed       | Rice Bran         | Millfeed           |
| Sampling Date     | No. Days | Pond 1 (965 fish)   | Pond 3 (690 fish)                 | Pond 5 (695 fish)                        | Pond 6 (785 fish)  | Pond 7 (740 fish)   | Pond 8 (935 fish) | Pond 9 (820 fish) | Pond 10 (820 fish) |
| #                 |          | ABW (gr.)           | ABW (gr.)                         | ABW (gr.)                                | ABW (gr.)          | ABW (gr.)           | ABW (gr.)         | ABW (gr.)         | ABW (gr.)          |
| 02/03/2011        | -        | 1.44                | 1.37                              | 1.84                                     | 1.54               | 1.19                | 1.41              | 2.36              | 2.59               |
| 08/04/2011        | 37       | 16.77               | 19.98                             | 16.50                                    | 20.43              | 13.15               | 29.89             | 20.94             | 24.42              |
| 13/05/2011        | 72       | 37.69               | 74.25                             | 41.48                                    | 43.35              | 37.49               | 74.59             | 38.34             | 48.93              |
| 08/06/2011        | 98       | 50.58               | 90.76                             | 72.61                                    | 71.19              | 51.31               | 108.32            | 59.42             | 67.93              |
| 27/06/2011        | 117      | 66.54               | 102.96                            | 77.42                                    | 70.40              | 56.98               | 127.28            | 63.51             | 73.74              |

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| RESULT: PHASE I & PHASE II (SIMILAR NO. OF DAYS) |          |                     |                   |                   |                    |                     |                                   |  |                     |
|--|----------|---------------------|-------------------|-------------------|--------------------|---------------------|-----------------------------------|--|---------------------|
| Biscayne Fish Farming Operation Phase I          |          |                     |                   |                   |                    |                     |                                   |  |                     |
|  |          | Fermented Rice Bran | Shrimp Feed       | Rice Bran         | Mill feed          | Fermented Rice Bran | Shrimp Feed                       | Rice Bran                                | Millfeed            |
| Sampling Date                                    | No. Days | Pond 1 (965 fish)   | Pond 3 (720 fish) | Pond 5 (695 fish) | Pond 6 (785 fish)  | Pond 7 (740 fish)   | Pond 8 (935 fish)                 | Pond 9 (820 fish)                        | Pond 10 (820 fish)  |
| #  |          | ABW (gr.)           | ABW (gr.)         | ABW (gr.)         | ABW (gr.)          | ABW (gr.)           | ABW (gr.)                         | ABW (gr.)                                | ABW (gr.)           |
| 07/09/2010                                       | -        | 1.61                | 1.50              | 1.89              | 1.93               | 1.69                | 1.45                              | 1.89                                     | 2.86                |
| 28/12/2010                                       | 112      | 54.97               | 102.27            | 30.96             | 60.81              | 43.1                | 104.29                            | 32.15                                    | 58.04               |
| Biscayne Fish Farming Operation Phase II         |          |                     |                   |                   |                    |                     |                                   |  |                     |
|  |          | Fermented Rice Bran | Shrimp Feed       | Rice Bran         | Mill feed          | Fermented Rice Bran | Shrimp Feed / Fermented Rice Bran | Fermented Rice Bran / Fermented Millfeed | Fermented Mill feed |
| Sampling Date                                    | No. Days | Pond 1 (965 fish)   | Pond 8 (935 fish) | Pond 9 (820 fish) | Pond 10 (820 fish) | Pond 7 (740 fish)   | Pond 3 (690 fish)                 | Pond 5 (695 fish)                        | Pond 6 (785 fish)   |
| #  |          | ABW (gr.)           | ABW (gr.)         | ABW (gr.)         | ABW (gr.)          | ABW (gr.)           | ABW (gr.)                         | ABW (gr.)                                | ABW (gr.)           |
| 02/03/2011                                       | -        | 1.44                | 1.41              | 2.36              | 2.59               | 1.19                | 1.37                              | 1.84                                     | 1.54                |
| 27/06/2011                                       | 117      | 66.54               | 127.28            | 63.51             | 73.74              | 56.89               | 102.96                            | 77.42                                    | 70.4                |



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| RESULTS: PHASE I & II (HARVEST TIME, 31 DAY DIFFERENCE) |          |                     |                   |                   |                    |                     |                                   |  |                     |
|---|----------|---------------------|-------------------|-------------------|--------------------|---------------------|-----------------------------------|--|---------------------|
| Biscayne Fish Farming Operation Phase I                 |          |                     |                   |                   |                    |                     |                                   |  |                     |
|   |          | Fermented Rice Bran | Shrimp Feed       | Rice Bran         | Mill feed          | Fermented Rice Bran | Shrimp Feed                       | Rice Bran                                | Millfeed            |
| Sampling Date   | No. Days | Pond 1 (965 fish)   | Pond 3 (720 fish) | Pond 5 (695 fish) | Pond 6 (785 fish)  | Pond 7 (740 fish)   | Pond 8 (935 fish)                 | Pond 9 (820 fish)                        | Pond 10 (820 fish)  |
|   | #        | ABW (gr.)           | ABW (gr.)         | ABW (gr.)         | ABW (gr.)          | ABW (gr.)           | ABW (gr.)                         | ABW (gr.)                                | ABW (gr.)           |
| 07/09/2010  | -        | 1.61                | 1.50              | 1.89              | 1.93               | 1.69                | 1.45                              | 1.89                                     | 2.86                |
| 02/02/2011  | 148      | 66.03               | 97.41             | *34.19            | 59.19              | 46.97               | 106.75                            | 39.38                                    | 64.00               |
| Biscayne Fish Farming Operation Phase II                |          |                     |                   |                   |                    |                     |                                   |  |                     |
|   |          | Fermented Rice Bran | Shrimp Feed       | Rice Bran         | Mill feed          | Fermented Rice Bran | Shrimp Feed / Fermented Rice Bran | Fermented Rice Bran / Fermented Millfeed | Fermented Mill feed |
| Sampling Date   | No. Days | Pond 1 (965 fish)   | Pond 8 (935 fish) | Pond 9 (820 fish) | Pond 10 (820 fish) | Pond 7 (740 fish)   | Pond 3 (690 fish)                 | Pond 5 (695 fish)                        | Pond 6 (785 fish)   |
|   | #        | ABW (gr.)           | ABW (gr.)         | ABW (gr.)         | ABW (gr.)          | ABW (gr.)           | ABW (gr.)                         | ABW (gr.)                                | ABW (gr.)           |
| 02/03/2011  | -        | 1.44                | 1.41              | 2.36              | 2.59               | 1.19                | 1.37                              | 1.84                                     | 1.54                |
| 27/06/2011  | 117      | 66.54               | 127.28            | 63.51             | 73.74              | *56.89              | 102.96                            | 77.42                                    | 70.40               |

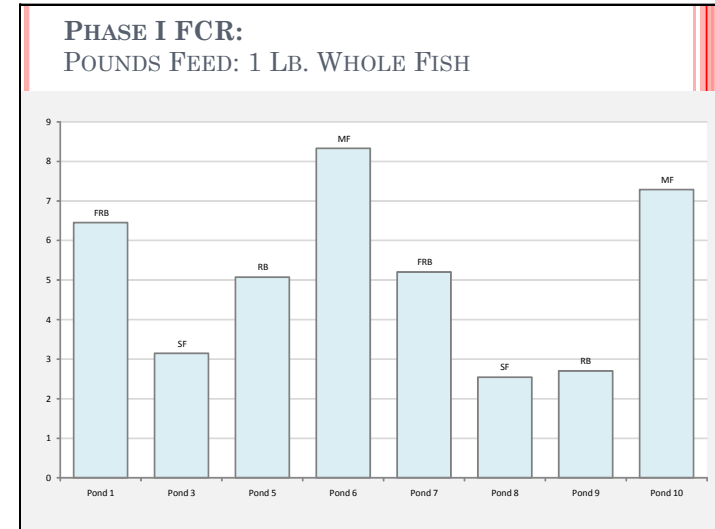
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| PHASE II SUMMARY |                |                     |               |            |      |                    |                       |              |
|------------------|----------------|---------------------|---------------|------------|------|--------------------|-----------------------|--------------|
| Pond Number      | ABW at Harvest | Percentage Survival | Feed Type     | Total Feed | FCR  | Unit Cost Lb. Feed | Cost / Lb. whole Fish | Culture Days |
| Pond 1           | 66.54          | 42.49%              | Ferm. R. Bran | 95,300.00  | 3.49 | 0.17               | 0.59                  | 117          |
| Pond 3           | 102.96         | 49.71%              | Shr. Feed/FRB | 82,850.00  | 2.35 | 0.47               | 1.09                  | 117          |
| Pond 5           | 77.42          | 48.20%              | FRB/FMF       | 95,408.60  | 3.68 | 0.16               | 0.59                  | 117          |
| Pond 6           | 70.40          | 52.36%              | FMF           | 134,155.90 | 4.64 | 0.15               | 0.70                  | 117          |
| Pond 7           | 56.89          | 51.49%              | FRB           | 71,900.00  | 3.32 | 0.17               | 0.56                  | 117          |
| Pond 8           | 127.28         | 53.26%              | Shr. Feed     | 116,175.00 | 1.83 | 0.76               | 1.39                  | 117          |
| Pond 9           | 63.51          | 62.56%              | Rice Bran     | 88,500.00  | 2.72 | 0.17               | 0.46                  | 117          |
| Pond 10          | 73.74          | 41.59%              | Mill Feed     | 123,700.00 | 4.92 | 0.15               | 0.74                  | 117          |

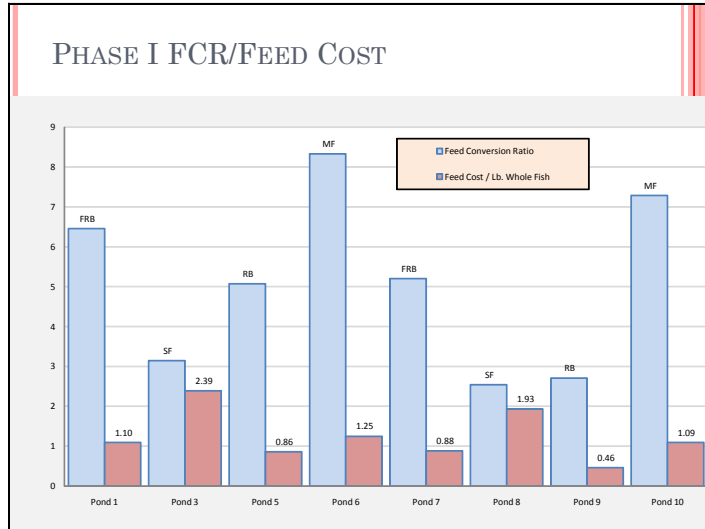
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| PHASE I SUMMARY |                |                     |               |            |      |                    |                       |                |
|-----------------|----------------|---------------------|---------------|------------|------|--------------------|-----------------------|----------------|
| Pond Number     | ABW at Harvest | Percentage Survival | Feed Type     | Total Feed | FCR  | Unit Cost Lb. Feed | Cost / Lb. whole Fish | Culture Period |
| Pond 1          | 66.03          | 23.83%              | Ferm. R. Bran | 112,226.21 | 6.45 | 0.17               | 1.10                  | 148            |
| Pond 3          | 97.41          | 52.78%              | Shr. Feed     | 121,727.05 | 3.15 | 0.76               | 2.39                  | 148            |
| Pond 5          | 34.19          | 45.18%              | Reg. R. Bran  | 54,448.76  | 5.07 | 0.17               | 0.86                  | 148            |
| Pond 6          | 59.19          | 30.70%              | Mill Feed     | 118,829.53 | 8.33 | 0.15               | 1.25                  | 148            |
| Pond 7          | 46.97          | 47.08%              | Ferm. R. Bran | 82,836.60  | 5.20 | 0.17               | 0.88                  | 148            |
| Pond 8          | 106.75         | 58.82%              | Shr. Feed     | 149,323.80 | 2.54 | 0.76               | 1.93                  | 148            |
| Pond 9          | 39.38          | 48.29%              | Reg. R. Bran  | 42,177.75  | 2.70 | 0.17               | 0.46                  | 148            |
| Pond 10         | 64.00          | 37.20%              | Mill Feed     | 142,245.43 | 7.29 | 0.15               | 1.09                  | 148            |

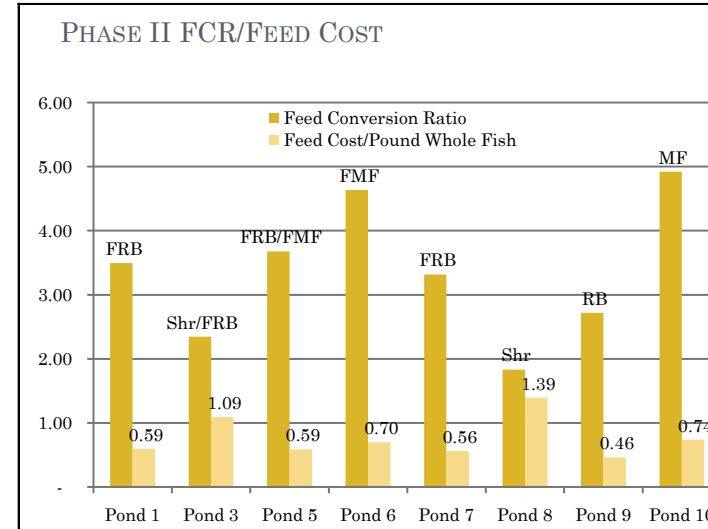
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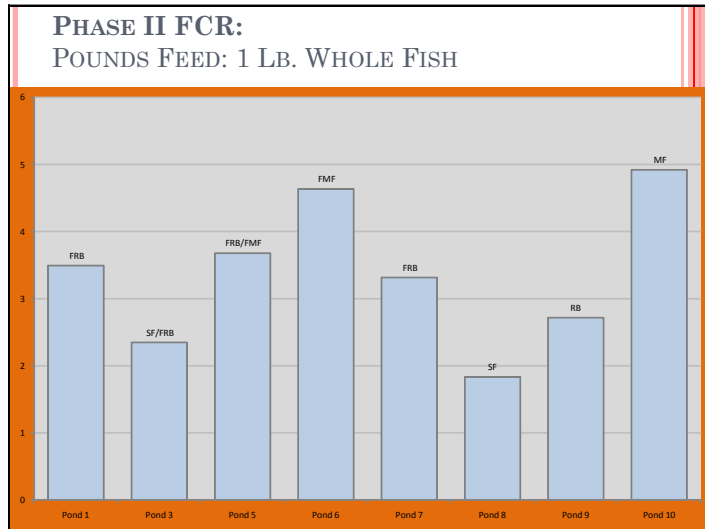
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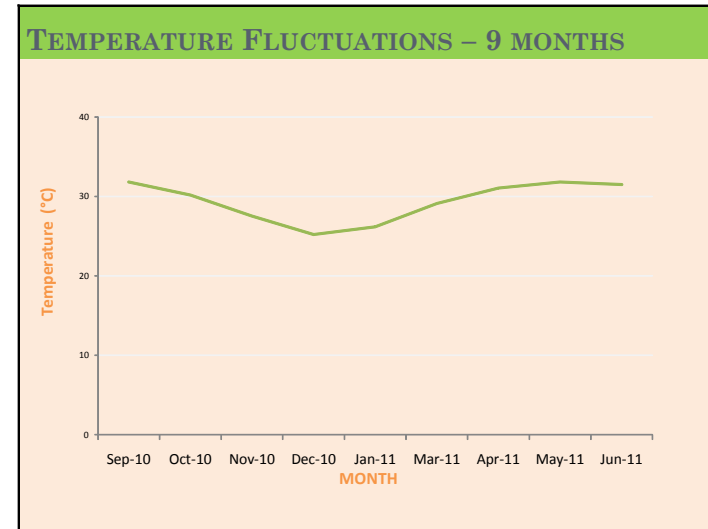
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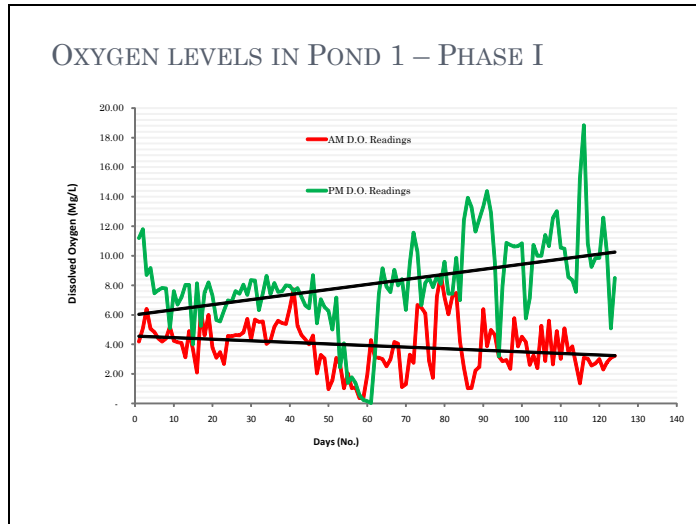
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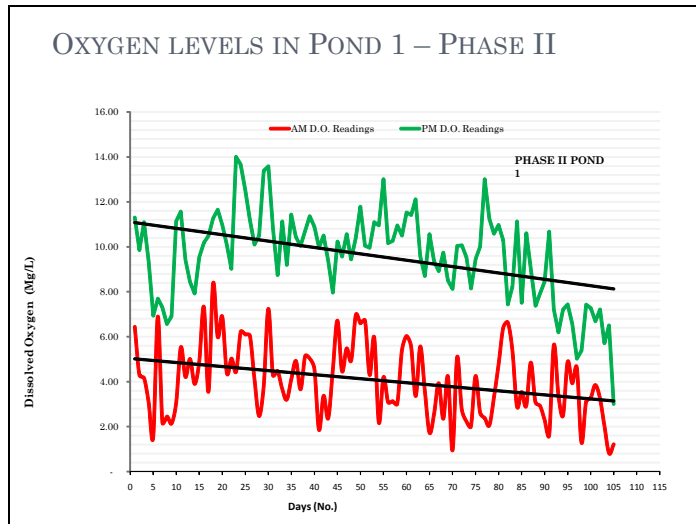
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## DISCUSSION

- Shrimp Feed is far superior. As expected
- The 50:50 presentation of Shrimp Feed and Fermented Rice Bran results in good growth rates reducing feed cost by 21.6% when compared to shrimp feed and by 40% compared to commercial tilapia feed.
- Mill Feed and Fermented Mill Feed diets showed faster growth rates (g/day) than Rice Bran and Fermented Rice Bran, but higher FCR ratios and production cost than the Rice Bran based diets. Regular Rice Bran ponds had the second best FCR's but lowest growth.
- Mill Feed is very palatable to Tilapias but is probably not as nutrient rich as Rice Bran. Fish can eat more Mill Feed but the FCR was high which result in high production cost.

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## DISCUSSION CONT'

- Improved survival rates were observed in all ponds in Phase II. This might be attributed to the addition of anti bird netting in the later part of the phase. Feeding was also much more aggressive in Phase II.
- The highest growth rate of course was seen in the Pond with SF. The best FCR was also in this pond.
- The second best growth rate and FCR was seen in the pond with the 50:50 SF:FRB mix.



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### CONCLUSION

- Shrimp Feed is the most expensive feed and as expected has the best growth rates, and best FCR's.
- RB had the best survival rate and the 3<sup>rd</sup> best FCR in Phase II. FRB has the lowest total feed cost and 4<sup>th</sup> best FCR. However growth rates of RB and FRB are low. Growth for FRB in Phase II for Pond 7 is related to stocking size. Need to evaluate data and determine biomass gained index.
- 50:50 SF:FRB, showed the 2<sup>nd</sup> best growth rate, 2<sup>nd</sup> best FRC and a 50% survival rate in Phase II.
- Physical and chemical parameters in ponds and potential bird predation might have contributed in low survivals, especially during Phase I.

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### CONCLUSION CONT'

- Enhancing natural pond productivity by additional of fertilizers to obtain better growth rates and FCR was not confirmed in Phase I.
- The supplementation of half of the shrimp feed diet with FRB can potentially reduce feed expenses by as much as 40% when compared to commercial floating feed for tilapia.
- This supplementation of 50:50 SF/FRB can improve growth rates.
- 50:50 SF:FRB has potentials for small-scale tilapia farming.

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### RECOMMENDATION:

- Perform experiments where the 50:50 Shrimp Feed: Fermented Rice Bran diet is applied to tilapia larger than a hundred grams.
- Initially, fish demand a high protein content and would require commercial diets to boost growth.
- Evaluate the economic viability of feeds, especially FRB from stocking of juveniles up to harvest.
- Perform feed trails by the addition of plant protein and other ingredients such poultry meal mixed into FRB after the fermentation process is complete.
- Acquire a small feed pelletizing machine for preparing feed diets. Pelletized feeds would improve FCR and reduce cost.
- Improve overall survival rates by installing anti bird netting in ponds at all times, especially during the critical nursery stages.

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### OTHER ON-GOING PROJECTS

- **Flowers Banks Project – farmer**
  - **Grow-out experimented conducted at a small-scale fish farm in Flowers Bank Village.**
  - **Two ponds were prepared and stocked with tilapia harvested from phase I.**
  - **One pond stocked with 1207 tilapias which were previously fed with FRB and Reg. rice Bran. Fermented Rice Bran is being applied.**
  - **One pond stocked with 888 tilapia which were previously fed shrimp feed. Shrimp feed is being applied.**
- **Experiment is still on-going. Proposed harvest in mid-September.**

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### SARTENEJA FISHING COMMUNITY PROJECT

- Sarteneja Aquaculture Development Association is comprised of fishermen.
- Project partially funded by the EU under the 'Small and medium enterprises development in Northern Belize'.
- Six grow-out circular HDPE tanks to be used for intermediate culture.
- Fish stocked in June, 2011.
- Fermented rice bran is being applied along with Tilapia Feed (50%:50%) in two tanks.
- JICA assisted farmers with husbandry equipment.
- Experiment is on-going.

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### ACKNOWLEDGEMENT

- IC Net Ltd.: Mr. Udagawa, Mr. Sasaki, Dr. Eda
- CRFM: Mr. Milton Haughton
- The Fisheries Department's Biscayne Staff: Mr. Neri Bol, Mr. Joe Saravia, Mr. Elroy Milligan, Mr. Hugh Tillet, Mr. Francisco Flores.
- The Fisheries Officers: Mr. Rigoberto Quintana & Mr. Miguel Sosa.



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THANK YOU



## Appendix 5(B): Small-scale Aquaculture Training Pilot Project – Jamaica



**Presentation of JICA/CRFM  
Pilot Project**

**“Improvement of Small Scale Tilapia  
Aquaculture in Jamaica through  
Extension and Training**

*2<sup>nd</sup> JICA/CRFM Regional Aquaculture Workshop; August 2011*  
*Robin Hall*

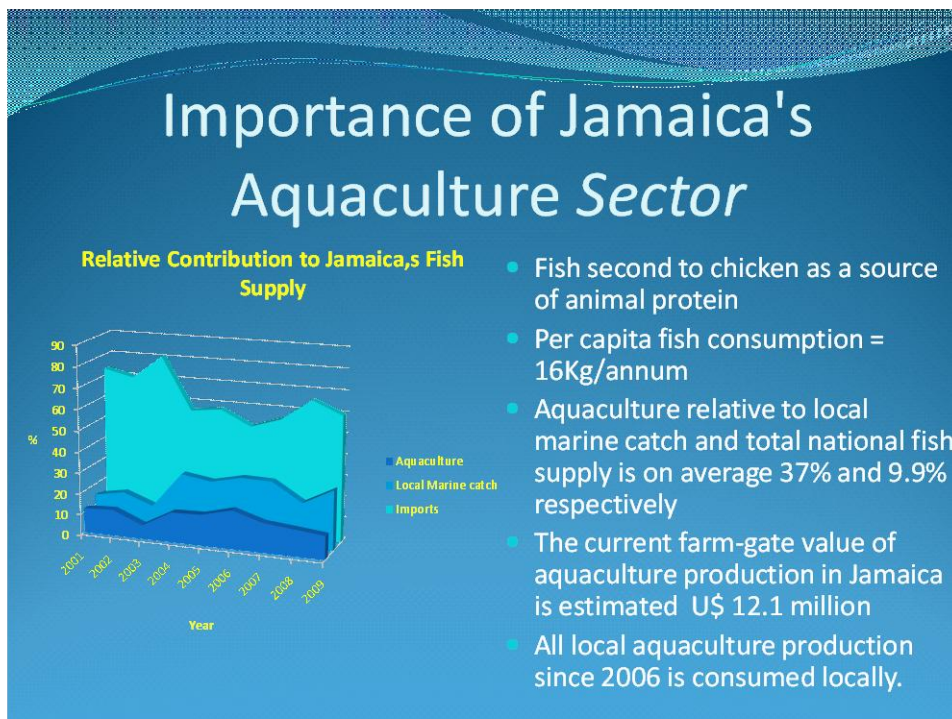
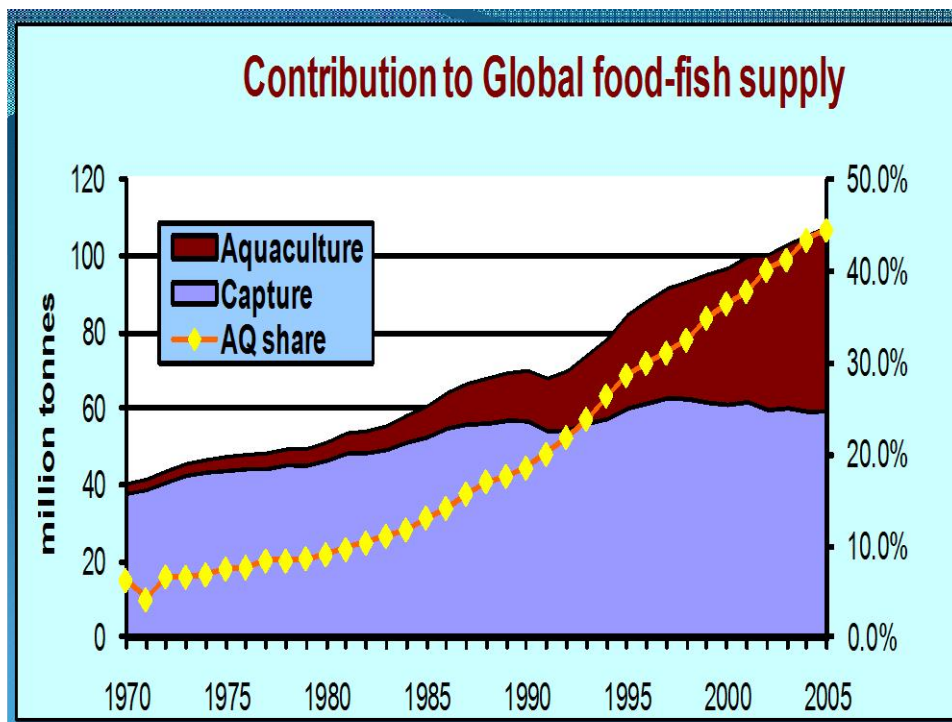
**Global Aquaculture**

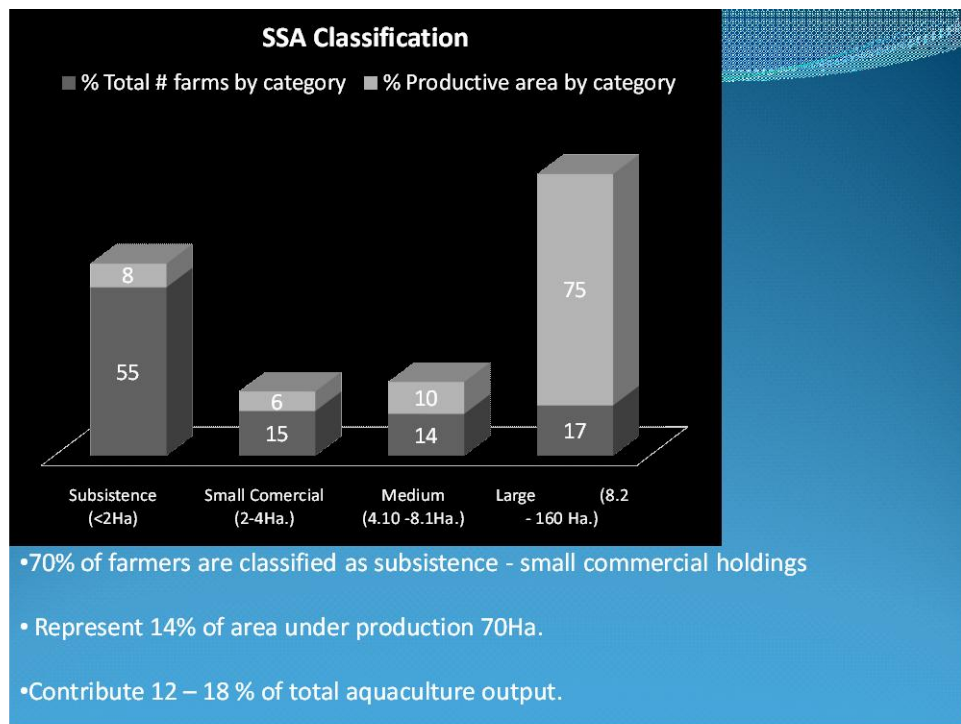
- Aquaculture fastest growing enterprise in the agricultural sector.
- 60 percent of aquaculture products come from Asia
- 90 percent are from SSA fish farms < 1.0 ha and( from integrated farming systems.)
- In 2030, world population is expected to reach 8.2 billion.
- If a per capita consumption of 16.7 to be maintained in 2030, it will require 137.5 million tonnes of fish, an additional 27.1 million tonnes from 2006 level.
- Production from capture fisheries at maximum level of exploitation then .
- Additional 27.1 million tonnes will have to come from Aquaculture

FAO. 2006. *The state of world aquaculture*, FAO Fisheries technical paper No. 500, Food and Agriculture Organization of the United Nations, Rome, FAO

2







## Definition of Small Scale Aquaculture

- Small-scale aquaculture (SSA) is a continuum of:
  - 1) systems involving limited investment in assets, some small investment in operational costs, including largely family labour and in which aquaculture is just one of several enterprises (*known in earlier classifications as Type 1 or rural aquaculture*);
  - 2) systems in which aquaculture is the principal source of livelihood, in which the operator has invested substantial livelihood assets in terms of time, labor, infrastructure and capital (*this was labeled as Type II SSA system*)

*Report of the FAO expert workshop on methods and indicators for evaluating the contribution of small-scale aquaculture to sustainable rural development* 24-28 November 2008, Nha Trang, Viet Nam  
<http://www.fao.org/docrep/012/i1138e/i1138e01.pdf>



# Jamaica SSA Characteristics



- Small land and water areas
- Family scale operations/businesses
- Often use family labor
- Often based on family land
- Vulnerability
- High levels of individualism
- Innovative
- Low levels of Literacy and Numeracy
- Inability to access financing

## Jamaica SSA Characteristics contd.

- Within the context of
  - ❖ National fiscal constraints,
  - ❖ Threatened state of local(possibly regional) fish stocks
  - ❖ The relatively high per capita demand for fish and fishery products
  - ❖ Loss of preferential trade agreements major agricultural commodities(sugar & bananas)

Then the preservation and expansion of the local aquaculture industry is critical to national food security, food sovereignty, contribute positively to the overall economic development of the country and provide jobs.

## Pilot Project Objective

### To improve

- *the management practices*
- *economic returns*
- *extension delivery*

for a select group of Small Scale and Subsistence Tilapia Farmers in Jamaica through the utilization of the extension arm of the “Ministry of Agriculture and Fisheries Aquaculture Branch.” (MOAF AQB)

## Program of Activities

- Base Line Survey
- Demonstration Pond Field Activity
- 3 Day training workshop
- Selection of Farmers for Field Monitoring/On farm Extension
- Stocking of Farmers
- Three week extension visits
- Market Support
- Program Evaluation.



# Baseline Survey

- List of potential candidates was generated by examination of historic records of seed stock sales.
  - Baseline survey methods
    - Questionnaire
    - Site Visit
- gather historic, social, economic, environment, technical and market data for small scale aquaculture producers.
- September 8 October 10, 2010
    - 21 Farmers Visited and questionnaires administered

## BASELINE SURVEY

- September 8 October 10, 2010
  - 21 Farmers Visited, questionnaires administered
- October 1 – October 15, 2010.
  - Review of field data to determine
    - Perceived/Actual farmer needs
    - Challenges
    - Opportunities
    - Infrastructure
    - Production
    - Demographics
    - Training needs



## Summary of Baseline Survey Findings

- 81% of the farms visited were lying dormant
- Challenges
  - Production costs
  - Market access requirements and standards for quality assurance
  - Access to financial resources to invest in change
  - Access to market, technical and business knowledge
  - Commercial/government institutions and services poorly oriented towards the small-scale farmer
  - No record keeping
  - Ineffective extension support

## Core Objectives of Tilapia SSA Intensive Training Workshop

*Participatory development and promotion of simple on farm "better management practices" - "BMPs"*

- Good pond preparation
- Good quality seed selection
- Water quality management
- Feed management
- Health monitoring/Biosecurity
- Disease management
- Better Harvest and post-harvest Practices
- Record keeping
- Environmental awareness





# Field Monitoring

- ❖ 11 farmers to include 3 women were selected to benefit from Field Monitoring
- ❖ They were supplied with basic equipment seed, feed and extension support through to market.

## Selection Criteria based on capacity to absorb the technical support.

- Relatively easy access
- Arranged in clusters
- Prior or existent demonstrated efforts to farm tilapia.
- Secure land tenure and access to adequate water supplies
- Capacity to prepare and fill pond for program
- Identified market
- Pond area less than 0.5 acre
- Clear commitment and alignment to program activities

# Inactivity



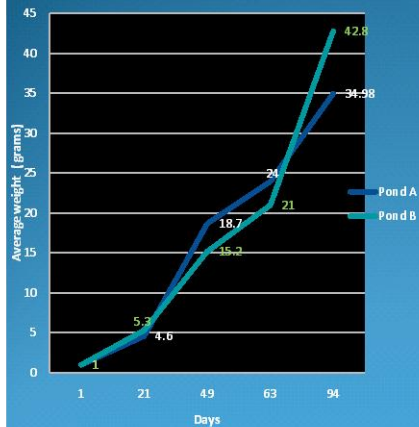
# Field Monitoring

- 11 farmers in strategic groupings to facilitate networking/clustering,
  - Cluster1 - St Thomas 3 Farmers
  - Cluster 2 - Clarendon & St Mary, St. Ann 4 Farmers
  - Cluster 3 - St. Catherine 2 Farmers
  - Cluster 4 – St Andrew 2 Farmers
- Total productive area of 14,000 m<sup>2</sup> which should yield an estimated 4.5MT of fish at end of pilot project.
- 30,000 fingerlings delivered.
- 66 extension visits were made over the 6 month period
- 1.2 MT has already been harvested and an estimated 1.7 MT remains in ponds to be harvested.



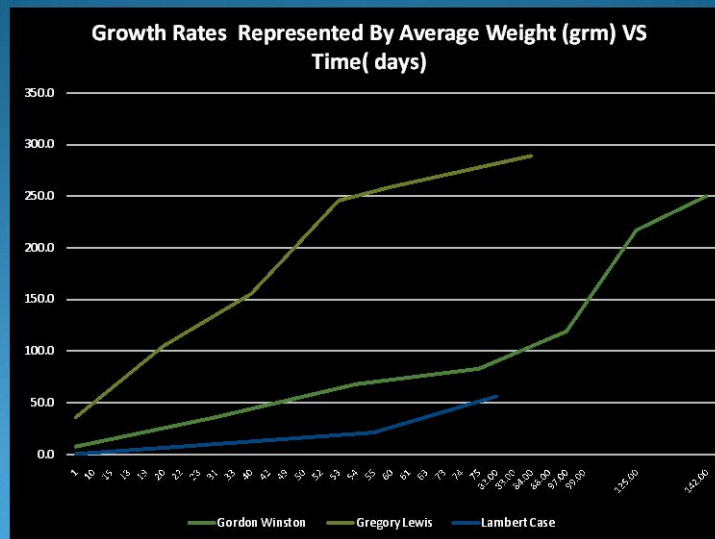


## Demonstration Pond Production Trial 1



|                              | Pond A     | Pond B     |
|------------------------------|------------|------------|
| Stk Date                     | 23/12/2010 | 16/12/2010 |
| Area (m <sup>2</sup> )       | 235.0      | 400.0      |
| Stock density/m <sup>2</sup> | 6.8        | 6.5        |
| # Stocked                    | 1600.0     | 2600.0     |
| Wgt Stk                      | 1.0        | 1.0        |
| Biomass Stk                  | 1.6        | 2.6        |
| # Crop Days                  | 94.0       | 101.0      |
| Avg. Harvest Wgt             | 35.0       | 42.8       |
| Tot. # Harvested             | 1415.0     | 2231.0     |
| Biomass @ Harvest            | 49.5       | 81.8       |
| Est. Total Feed              | 74.1       | 114.0      |
| F.C.R.                       | 1.5        | 1.4        |
| % Survival                   | 88.4       | 85.8       |

## Field Monitoring Growth Data



## Preliminary Financial Analysis

Gregory Lewis

| BATCH # 1                |            | ASSUMPTIONS                   |                     |           | % Cost Structures |    |
|--------------------------|------------|-------------------------------|---------------------|-----------|-------------------|----|
| Revenue                  | JAS        | Production Characteristics    | Units               | Value     | Feed              | 32 |
| Tilapia Sales            | 272,977.55 | Stocking density              | fish/m <sup>2</sup> | 0.94      | Seed              | 31 |
| Total Income             | 272,977.55 | Surface area of pond          | m <sup>2</sup>      | 4046      | Labor             | 26 |
|                          |            | Initial number stocked        | #                   | 3803.24   | Net Income        | 11 |
| Fixed Farm Cash Expenses | 15,000.00  | Initial average weight        | g                   | 30        |                   |    |
| Variable Cash Expenses   |            | Initial biomass stocked       | kg                  | 114.1     |                   |    |
| Seed                     | 76,064.80  | Tilapia Seed cost             | JAS                 | 20        |                   |    |
| Feed                     | 79,411.69  | Duration of Crop              | days                | 90        |                   |    |
| Fertilizer               | 3,000.00   | Tilapia selling price         | JAS/kg              | 330       |                   |    |
| lime                     | 1,000.00   | Unit Price Feed               | JAS                 | 68        |                   |    |
| Field labour production  | 64,285.71  | F.C.R                         | ratio               | 1.60      |                   |    |
| Water                    | 7,970.62   | Growth Rate                   | g/day               | 2.9       |                   |    |
| Security                 | 5          | Final number of tilapia       | #                   | 28524.3   |                   |    |
| Variable Cash Expenses   | 231,732.79 | Individual avg harvest weight | g                   | 290       |                   |    |
|                          |            | Yield                         | kg                  | 827       |                   |    |
| Total Expenses           | 246,732.79 | Survival                      | %                   | 75        |                   |    |
| NET CASH INCOME          | 26,244.77  | Total Feed Used               | kg                  | 1329.83   |                   |    |
|                          |            | Total Cost feed               | JAS                 | 79,411.69 |                   |    |
| Break Even/Kg            | 298.27     | Minimum Wage/wk               | JAS                 | 5000      |                   |    |
| Break Even/Lb            | 135.58     | Water                         | cu. m               | 1.97      |                   |    |

## Preliminary Financial Analysis

Winston Gordon

| BATCH # 1                |            | ASSUMPTIONS                   |                     |           | % Cost Structures |       |
|--------------------------|------------|-------------------------------|---------------------|-----------|-------------------|-------|
| Revenue                  | JAS        | Production Characteristics    | Units               | Value     | Feed              | 33    |
| Tilapia Sales            | 259,134.80 | Stocking density              | fish/m <sup>2</sup> | 2         | Seed              | 13    |
| Total Income             | 259,134.80 | Surface area of pond          | m <sup>2</sup>      | 2023      | Labor             | 44    |
|                          |            | Initial number stocked        | #                   | 4046      | Net Profit        | 6     |
| Fixed Farm Cash Expenses | 15,000.00  | Initial average weight        | g                   | 7.6       |                   |       |
| Variable Cash Expenses   |            | Initial biomass stocked       | kg                  | 30.7      |                   |       |
| Seed                     | 32,368.00  | Tilapia Seed cost             | JAS                 | 8         |                   |       |
| Feed                     | 80,960.46  | Duration of Crop              | days                | 149       | \$/Lb             | \$/Kg |
| Fertilizer               | 3,000.00   | Tilapia selling price         | JAS/kg              | 440       | 150               | 330   |
| lime                     | 1,000.00   | Unit Price Feed               | JAS                 | 60        | 180               | 396   |
| Field labour production  | 106,428.57 | F.C.R                         | ratio               | 2.30      | 200               | 440   |
| Water                    | 3,985.31   | Growth Rate                   | g/day               | 1.9       | 220               | 484   |
| Security                 | 7          | Final number of tilapia       | #                   | 2023      |                   |       |
| Variable Cash Expenses   | 227,742.34 | Individual avg harvest weight | g                   | 290       |                   |       |
|                          |            | Yield                         | kg                  | 587       |                   |       |
| Total Expenses           | 242,742.34 | Survival                      | %                   | 50        |                   |       |
| NET CASH INCOME          | 15,392.46  | Total Feed Used               | kg                  | 1349.34   |                   |       |
|                          |            | Total Cost feed               | JAS                 | 80,960.46 |                   |       |
| Break Even/Kg            | 413.76     | Minimum Wage/wk               | JAS                 | 5000      |                   |       |
| Break Even/Lb            | 188.07     | Water                         | cu. m               | 1.97      |                   |       |

If Survival  
increases to 70%  
net profits  
increase to \$86K

## Field Monitoring Growth Trial

### Larger Seed

- Quicker crop cycles.
- Improved cash flow
- Better attention from farmer
- Reduced problems with bird predation
- Reduced Chara problems
- Reduced competition from recruits



## Financial analysis

- Financial analysis for differing stocking scenarios is currently being done.
- Improvement in cash flow and spread of risk to farmer if production cycle is broken down to:
  - Intermediate fingerling production 1gm – 40 gm 90 days
  - Food fish production. 40 gm – 280 gm 90 days
- The sustainability of small scale tilapia aquaculture can only be realized if farm operations are profitable.



## “Failing To Plan is Planning To Fail.”

- Plan and develop a market for your aquaculture products.
- Remain competitive as a small-scale aquaculture producer
- capture more of what the consumer pays.
- Forming a marketing cooperative or alliance can be helpful in direct marketing
- Product, Price, Place (Distribution), and Promotion.



## Market Support



Given the relatively high cost of production and competition from cheap imports (Outside the farmers control) farmers were encouraged to

- Target niche markets that command the highest price for product by
- Selling directly to consumer through;
  - Establishment of live fish sales outlets in urban and peri-urban centers
  - Events marketing targeting fairs
  - Fee fishing
  - Diversify product offering through poly culture
- Value adding by cold smoking of tilapia

To this end farmers were supported to participate in Food service preparation and delivery at the 3 day Denbigh Agricultural Fair July 30 – August 1



# Denbigh

- Five Farmers got “Government Approved Food Handling certificates”
- 4 Farmers exposed to
  - Live transport and Live sales
  - Acceptable cold chain protocol
  - Cold Smoking process
  - Food service and delivery
- 500 Lbs, smoked and cooked fish sold
- 113 lbs of live fish sold
- Net earnings to farmers approximated to JA\$280/Lb as opposed to a wholesale price of JA\$175/Lb.
- Successful private/public sector partnership



## Preliminary Indicators

- Despite increased efficiencies at the farm level there is a clear need to
  - Introduce intermediary fingerling producers
    - Supply larger fingerlings, which would contribute to shorter crop cycles thus increasing cash flow.
  - Find/develop alternative or cheaper feeds
  - Improve crop survival through
    - Improved seed delivery techniques
    - Effective tools to combat macro algal growth in ponds
    - Implementation of bird deterrent devices

## Preliminary Indicators

- Reinforce record keeping
- Maintain farmer motivation and focus. Farmer usually has other income streams and easily gets distracted.
- Resources constraints often drive farmers to make bad decisions
- Repetition is the cardinal law of learning then desired change can only come about through repeated demonstrated efforts.
- Suggest extension of project, however include a cost sharing component



## Sustainability & Future direction for Jamaica's SSA

- Extension
  - Strong focus on record keeping
  - Increase motivation of extension through performance based targets
  - Broaden extension support to incorporate other non technical issues i.e. business facilitation, social dynamics.
  - Develop public private approach to extension utilizing farm group leaders/specialists

## Sustainability & Future direction for Jamaica's SSA



- Target one Cluster (Cluster2) to develop BMP's and self sustaining PBMO.
  - MOAF AQB + SSA farmers association develop project and MOAF AQB or other third party provide stewardship:
  - Incorporation of BMP/ EBA to support/develop product differentiation and SPS standards necessary to secure niche market access ( organic tilapia, value added i.e. ready to cook preparations and quality fresh live product,
    - seek technical / financial support from small grant facilities
    - utilize local institutional arrangements engaging public /private partnership's i.e. RADA, PCS , processors/distributors of food, spices and condiments

## Assessment of the Impact of small-scale aquaculture to rural development

- Adoption of improved practices and productivity (Standard BMP's)
- Increased Income or levels of fish consumption/nutrition
- Improvement in living standards based upon the extra income achieved.







## Small Scale Aquaculture development requires combined efforts

## PARTNERSHIP FOR PROGRESS

## POLITICAL ENDORSEMENT



**Satisfied, energized and committed  
to national development**



**Thanks to all who  
made this effort a  
success**

## **Appendix 6: Draft Concept Paper: Formation of a Regional Network of Aquaculture Organizations**

### **1.0 Introduction**

According to the FAO State of World Fisheries and Aquaculture Report 2010, aquaculture continues to be the fastest-growing animal-food-producing sector and to outpace population growth, with the per capita supply increasing from 0.7 kg in 1970 to 7.8 kg in 2008. It accounted for 45.7 percent of the world's fish food production for human consumption in 2008, and is set to overtake capture fisheries as a source of food fish. While aquaculture production (excluding aquatic plants) was less than 1 million tonnes per year in the early 1950s, production in 2008 was 52.5 million tonnes, with a value of US\$98.4 billion (FAO, 2010).

The fishery sector is a source of income and livelihood for millions of people around the world. It is estimated that, in 2008, 44.9 million people were directly engaged, full time or part time, in capture fisheries or in aquaculture, and at least 12 percent of these were women. It is also estimated that, for each person employed in capture fisheries and aquaculture production, about three jobs are produced in secondary activities, including post-harvest, for a total of more than 180 million jobs in the whole of the fish industry (FAO, 2010).

The majority of fishers and aquaculturists are in developing countries, mainly in Asia, which has experienced the largest increases in recent decades, reflecting in particular the rapid expansion of aquaculture activities. In 2008, 2.9 percent of fishers and fish farmers were to be found in Latin America and the Caribbean (FAO, 2010).

The aquaculture sector is not well developed in the CARICOM region, with significant development limited to countries like Jamaica and Belize. Other countries like Guyana, Suriname and Trinidad and Tobago have begun to put more emphasis on aquaculture as an area for development. The practices mainly involve the use of ponds to culture such species as penaeid shrimp, tilapia, carp and cachama. Also, there is long line culture for algae in St. Lucia and the mangrove oyster in Jamaica.

Most CARICOM states have limited land and fresh water resources, however some, like Belize, Guyana and Suriname, do have ample supplies. On the other hand, most states have larger expanses of marine space than land mass, which offers the potential for the promotion and development of mariculture. As such, the approach to aquaculture development will have to be multifaceted in its focus, design and implementation in order to address the needs of those with ample land and fresh water resources and those with less of these resource endowments.

The CRFM has identified the promotion and development of aquaculture as one of the programme areas within its Strategic Plan and Medium Term Plans 2004/2007 and 2008/2011. With this in mind it included aquaculture development policy formulation as one of the areas to be addressed under the CARICOM/CRFM/JICA Study on the Formulation of a Master Plan on Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean.

At the First Regional Aquaculture Development Planning Workshop held in Jamaica from March 14 to 21, 2011, following on a presentation entitled *Formation of a Regional Network of Aquaculture Organizations* by the representative from the CRFM Secretariat, participants requested that a concept paper be prepared and circulated for further discussion, as it was opined that a regional network of

aquaculture organizations could provide valuable support in the renewed thrust in aquaculture development in the region. This Concept Paper has been drafted/prepared in keeping with this request.

## **2.0 Definition of a network**

A network can be defined as a set of actors/organizations called nodes which are tied/connected by one or more specific types of interdependency, such as friendship kinship, common interest, financial exchange, information exchange, physical assistance, dislike or relationships of beliefs, knowledge or prestige ([http://en.wikipedia.org/wiki/Social\\_network](http://en.wikipedia.org/wiki/Social_network)). Networking can be seen as a strategic effort to build and cultivate relationships that provides one with a system to advance issues and meet specific needs e.g. cultivate growth, communicate vision to partners, open and supportive.

## **3.0 Proposed Caribbean network of aquaculture organizations**

The presentation at the Workshop used the Network of Aquaculture Centres in Asia and the Pacific (NACA) as a model of the type of network that could be developed within the Caribbean context. NACA is an intergovernmental organization that promotes rural development through sustainable aquaculture. It seeks to improve rural income, increase food production and foreign exchange earnings and to diversify farm production, with the ultimate beneficiaries being farmers and rural communities. The members of NACA are Australia, Bangladesh, Cambodia, China, Hong Kong SAR, India, Indonesia, I.R. Iran, Korea (DPR), Laos PDR, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam (<http://www.enaca.org/modules/about/index.php>).

Its core activities are:

- capacity building through education and training;
- collaborative research and development through networking among centers and people;
- development of information and communication networks;
- policy guidelines and support to policy implementation and institutional capacities;
- aquatic animal health and disease management; and
- genetics and biodiversity (<http://www.enaca.org/modules/about/index.php>).

At the March 2011 Regional Aquaculture Development Planning Workshop, participants, using the problem analysis component of the Project Cycle Management (PCM) tool, identified significant issues in areas such as aquaculture policy, legislation, administration, technology, finance, marketing and capacity. When one considers that the aims of and resource requirements for sustainable freshwater and marine aquaculture development in the Caribbean are likely to be similar to those of the membership of NACA, the NACA model can provide a likely approach for the development of a Caribbean network under the umbrella of the CRFM.

As such, using the NACA model as a reference (<http://www.enaca.org/modules/about/index.php>), the objectives of the Proposed CARICOM/CRFM network of aquaculture organizations could be to assist in the regional and national efforts to expand aquaculture development mainly for the purposes of:

- increasing food production and security;
- improving rural income and employment;
- diversifying farm production; and
- increasing foreign exchange earnings and savings.

In order to facilitate the achievement of these objectives, the following could be done:

- establish a network of aquaculture and related organizations to share the responsibility of research, training and information exchange essential to aquaculture development in the region;



- strengthen institutional and personal links among national and regional organizations through the exchange of technical personnel, technical know-how and information;
- promote regional self-reliance, including capacity development, in aquaculture development through Technical Cooperation among Developing Countries (TCDC); and
- promote the role of women and youth in aquaculture development.

The composition of the network could include fisheries authorities, regional and national universities, other aquaculture related training and research institutions, producer cooperatives, private sector firms and national and regional aquaculture stakeholder organizations in CRFM Member States. The network would also seek to establish partnerships with relevant organizations in non-CRFM countries, donor foundations, development agencies and non-governmental organizations. The CRFM would take the lead in promoting and establishing the network.

The likely functions of the proposed Caribbean Network of Aquaculture Organizations could include:

- assist members in feasibility studies, policy, planning and project formulation;
- conduct disciplinary and interdisciplinary research on selected aqua-farming systems for adaptation or improvement of technologies, and for the development of new technologies;
- train and upgrade core personnel needed for national aquaculture planning, research, training, extension and development;
- establish a regional information system to provide appropriate information for development planning, research and training;
- assist members in strengthening their national organizations linked to the regional organizations;
- assist the national organizations in testing and adapting existing technology to local requirements and in the training of technicians, extension workers and farmers at the national level;
- transfer to the national organizations appropriate aquaculture technologies and techniques developed at regional organizations;
- facilitate the exchange of national experts, technical know-how and information within the framework of TCDC; and
- develop programmes for the promotion of women and youth participation in aquaculture development at all levels.

The Way Forward could be as follows:

- Review and refine the Concept Paper at the Follow-up Regional Aquaculture Development Planning Workshop in Jamaica in August 2011.
- Develop and include a proposal for the establishment of the Aquaculture Network in the Aquaculture Development component of the Master Plan by September/October 2011.
- Set up a working group to promote the development of the Aquaculture Network by August/September 2011.

#### **4.0 References**

FAO, 2010. The State of World Fisheries and Aquaculture 2010. 218 pp.  
[http://en.wikipedia.org/wiki/Social\\_network](http://en.wikipedia.org/wiki/Social_network)  
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