FINAL REPORT

Consultancy to Identify Sub-Projects on Climate-Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture, and Other Alternative Livelihoods

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**

(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**

Government of JAMAICA

Vernon "Patrick" Barrett

15 March 2021

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1. Executive Summary

The Ministry of Industry, Commerce, Agriculture and Fisheries secured, through the Government of Jamaica, funding from the International Bank for Reconstruction and Development (IBRD) for the execution of the composite, multi-faceted Project entitled - "**Promoting Community-based Climate Resilience in the Fisheries Sector"** - aimed at enhancing community-based climate resilience among targeted fishing and fish farming communities of Jamaica.

The tender to execute the Consultancy entitled "Identify Sub-Projects on Climate-Resilient Freshwater Aquaculture, Coastal Mari-culture/Polyculture, and Other Alternative Livelihoods", which forms a part of this overall Project, was secured by Vernon Barrett, and delivered during the period of early September 2020 to mid-March 2021. (There were delays experienced in the proposed initial start of July 2020, arising from the global COVID19 pandemic).

The Scope of Work outlined in the Contract consisted of two elements:

1. The **identification of Climate-Resilient Aquaculture Sub-Projects** for New and Existing Fish Farmers and Climate-Resilient Mariculture/Polyculture and Alternative Livelihood Sub-Projects

2. The **development of Initial Concept Notes for Climate-Resilient Aquaculture Sub-Projects** for New and Existing Fish Farmers and Climate-Resilient Mariculture/Polyculture and Alternative Livelihood Sub-Projects

After extensive research, discussions, and engagement with identified stakeholders and prospective third parties the Sub-projects were conceptualised and shortlisted for presentation at a Validation Workshop on January 14, 2021 at the Jamaica Pegasus Hotel (and virtually by Zoom) attended by the Hon Minister Floyd Green, the newly appointed Chief Executive Officer of the National Fisheries Authority - Dr Gavin Bellamy – and many representatives from the diverse stakeholder communities.

This confirmation process led to the further development of the proposed sub-projects into six (6) individual Initial Concept Notes which accompany this Final Report as the key output from this assignment. These were then augmented by a further 3 Supplemental Sub-Projects following discussions with the NFA representatives to support priority emerging Aquatic Sectors (Pelagic Fisheries, Ornamental Fish & Sea Cucumber). It is anticipated that all 9 Sub-projects will be detailed into Project Proposals which will be subsequently implemented to achieve the programmes objectives in due course.

The author would like to personally thank the many dedicated and committed contributors to this assignment who were consulted throughout its execution who hailed from: Fish Sanctuaries, Fisherfolk Communities, Fisherman's Cooperatives, National Institutions and Organisations, International Agencies, NGOs, Ministries of Government, Government Agencies, Private Sector companies who are too numerous to mention individually. Specific mention must be given to Ms Selena Ledgister and Ms Mellisha Meeks (Ministry of Agriculture and Fisheries), with many thanks and gratitude for their support and guidance during the execution of this assignment and, also, to Dr Gavin Bellamy, Mr Courtney Cole, Mrs Smikle, and the team at the National Fisheries Authority for their insights, feedback, and comments along the way.

2. Conclusions & Recommendations

The marine ecosystems off the coast of Jamaica continues to be under adverse pressures of human activity at sea and on land from overfishing, pollution, environmental degradation and so on.
Efforts are underway to try and address the many complex issues, but the situation has been compounded by the COVID19 pandemic and its resultant impact on the country's economy with job losses and reduced livelihood incomes. Increased incursions have been reported into the Fish Sanctuaries and more people are apparently taking to the sea to secure their own food supplies and/or to eke out alternative livelihood sources.

The Fisheries sectors – both Fresh water and Maritime - has been, historically, been perceived to be of secondary importance in the considerations of the Government of the day and attempts are being made to correct this with the recent creation of the National Fisheries Authority. Although the World Bank funding for this project, and the wider programme of which it formed a part, is greatly welcomed it is inadequate to address the many challenges which pose an existential threat to the island of Jamaica – dysfunctional socio-economic pressures, climate change actions, ecosystem decimation, environmental degradation etc.

Some difficult decisions therefore had to be made in prioritising expenditure in the many areas in need of assistance and best endeavour was made to objectively identify and allocate the resources where they would be of maximum impact to the targeted beneficiaries. There has been an unfortunate history of "stop-start" actions and "piecemeal" approaches in certain aspects of Jamaica's Aquaculture and Mariculture Sectors, which has not led to the desired impact on scale. There has also been an absence of a "continuity of purpose" and limited visionary interventions historically which do not keep pace with the changing external realities – in Jamaica and globally – necessary to exploit the opportunities and manage the threats as they arise, on an ongoing and dynamic basis.

The challenges facing the Mariculture and Aquaculture Sub-sectors are more than just technical – although Jamaica would do well to keep abreast of the global technological revolutions that can help ensure the necessary sector transitions are viable and sustainable. The underlying issues are predominantly rooted in human, social, commercial, economic, and environmental factors. The final list of sub-projects attached seeks to address several of these concerns in a multi-faceted, partnership approach involving diverse stakeholders.

The Sub-Projects have been designed to address the shortcomings identified:

- Strengthening Institutional capacity to support the continual development of the sectors.
- Fostering cooperation between various stakeholders in the value and supply chains
- Assigning custodianship and lead roles to designated parties.
- Prioritising Ecosystem-based recovery & conservation as the foundation for sustainability
- Alignment with Jamaican Government's strategies and plans for Climate Change Adaptation, Blue Economy Future, Fisheries Sector Development, Food Security, Green Agenda
- Building on previous or ongoing initiatives that have shown promise of success.
- Transitioning from "taking" to "nurturing and farming" the marine and aquatic resources

The geographical coverage of the sub-projects is spread evenly across the island and is a mix of supporting existing sectoral activity (such as Tilapia Fish Farming and Ornamental Fish Farming) and catalysing new Aquatic Sector development, namely:

- Farming seaweed varieties specifically sea moss
- Piloting the introduction of Sea Cucumber propagation
- Catalysing Renewable Energy applications into aquatic environments
- Pelagic Fisheries
- Community Fish Farming (Basa)

These sub-projects will generate alternative livelihoods in important Blue Economy areas such as:

- Farming marine life at sea (plants and animals)
- Eco-tourism related jobs (mangrove wardens and tour guides)
- Value addition in processing of harvested marine life and freshwater fish
- Ecosystem based conservation & Climate Change Response Actions
- Jobs related to Community Aquaculture (Basa)
- Renewable energy for aquatic facilities – design, installation, operation, & maintenance

In designing the approach to executing the sub-projects, there were certain practical limitations to consider. For example, direct financial support to fishers and/or their communities was not feasible or pragmatic as many entities were not legally constituted to directly receive or administer funds. Therefore, the method taken was for Fish Sanctuaries to take the lead and partner with Fisher Communities who would be funded and strengthened through joint actions.

Where feasible, Sub-projects were designed to tap into other ongoing successful initiatives and proven "ways-of-working" (in Jamaica) constructs – building on what already works. Where information about certain Sectors was inadequate or not current, Supplemental Sub-Projects (A, B, C) were conceptualised and written up, to synergize with and support other World Bank Programme Components (e.g., Component 3) and/or link to other "standalone" Sub-projects (e.g., 2).

3. Next Steps

The World Bank funds, totalling US$1.4785 million, has been fully allocated to finance all the 9 Sub-projects developed (Nos. 1-6 and Nos. A, B, C):

- Detailed Initial Concept Notes have been provided for the "standalone" Sub-projects No. 1-6 (see separate attached documents) which are summarised in Appendix 1.
- Supplemental Sub-Projects (A, B, C) - described in Appendix 2 and summarised in Appendix 2a – are designed to integrate into Component 3 of this related World Bank Programme. As per the NFA request, they will lend financial support to the development of the Pelagic Fisheries, Ornamental Fish and Sea Cucumber Sectors, respectively.

A Risk Analysis Matrix has been provided below in Table 1 below which will serve to guide the next steps in bringing these Sub-projects into being. This process will include the development of detailed project proposals and sign offs by the respective parties and stakeholders involved, after appropriate assent by the Steering Committee Members.

TABLE 1 – RISK ASSESSMENT & FEASIBILITY RATING OF SUB-PROJECTS

Sub-Project ID.	Sub-Project Name	Main Risk Factors (Environmental & Social)	Mitigation Measures	Feasibility Assessment & Rating
1	Farming Seaweed & Processing Sea Moss	Use of new seaweed variety may be needed to ensure feasibility. Adoption by local people into lifestyle and livelihood – earnings? Praedial Larceny risk exposure while growing out sea moss	FAO involvement for expert guidance to avoid invasive species issues. Using proven model in Eastern Caribbean Local Fisher Community benefitting financially from sea moss will provide some community "security cover"	Leadership by Fish Sanctuary - operating in a protected, monitored environ - should ensure success. A – Good Feasibility
2	Renewable Energy in Aquatic Applications	Exposure of equipment to storm/hurricane damage / theft Trained beneficiaries migrate to urban jobs to earn better living. Sale of project equipment after project ends	Solar Panels and electric motor charge kits are portable. Embed the training and know-how at an institutional / organisational level. Ownership of project property resides with an Institution/Community	Similar smaller scale intervention has been implemented several years ago in another area successfully. A – Good Feasibility
3	Sustaining Vulnerable Fish Sanctuaries	Tensions could arise between Fish Sanctuaries and rogue fishers with enforcement leading to dysfunctional behaviour - sabotage / corruption. Theft of project equipment by rogue parties during or after project Compromised intelligence gathering & surveillance activity	Engagement and alliances with law enforcement agencies. Provision of alternative income sources to the immediate coastal community members through project engagements Recording camera devices will capture and remotely store illicit / illegal actions providing evidence. Multiple parties will be involved, sharing information, providing transparency	Credible Partners who have a great track record of delivering projects A – Good Feasibility

Sub-Project ID.	Sub-Project Name	Main Risk Factors (Environmental & Social)	Mitigation Measures	Feasibility Assessment & Rating
4	Revitalising Fresh Water Fish Farming	Climate resilience measures are not fully adopted or regularly updated by beneficiaries despite training. Institutional memory loss at Ebony Park due to faculty turnover Tensions arise between the different stakeholders in supply chain. Conflicting objectives due to commercial potential / resource constraints	HEART/NSTA to serve as "Custodian" of this area of knowledge and expertise – document and embed it in its curriculum and courses. HEART/NSTA (Ebony Park) act as a neutral and honest broker with Fish Farmers and their associated communities Ring-fence the operations of the Aquaculture Programme to sustain it	Major existing player with existing networks and infrastructure on which to build out new capabilities and capacity for the sector. A – Good Feasibility
5	Livelihoods in Mangrove Conservation	Relevant Authorities do not "Walk the Talk" in protecting Mangrove areas resulting in more clearings for hotel resorts	Link this sub-project to other ongoing Climate Change, Environmental and Ecosystem actions across Jamaica. Make Mangrove Tours a key aspect of eco-tourism offering via Ministry of Tourism	Substantial ecosystem knowledge & capability in country has been developed in recent years but not translated into benefits to coastal communities. Good Partnership will convert this unrealised potential for livelihoods. A – Good Feasibility
6	Piloting of Community based Fish Farming (Basa)	Perception issues around small scale farming one's own fish and eating the "new" fish variety. Water access and use in rural communities and proper managing of waste by-products. Adequate income to retain the beneficiaries' interest	CASE to lead in the marketing and selling of the benefits of the project through its students and faculty. Demonstrate necessary actions in pilots as part of the project and follow-up with beneficiaries. CASE to provide end market for fish products	Committed Stakeholders with good track record of delivery. Partnership in the project brings together complimentary skills and knowhow. A – Good Feasibility

Sub-Project ID.	Sub-Project Name	Main Risk Factors (Environmental & Social)	Mitigation Measures	Feasibility Assessment & Rating
A	Sea Cucumber Mariculture Sector Development Support	Indigenous species may need development of new cultivation knowhow with the related challenges. Action may trigger uncontrolled harvesting from the wild Praedial larceny from project farms	Liaise with FAO and other international experts on propagation processes for sea cucumber. Restrict / license local sales channels and regulate export activity. Locate the pilot grow out in a protected and monitored environ such as a Sanctuary	Early stage of sector development with some "unknown, unknowns". Piloting such a project is the only way to determine the possible outcomes and feasibility of developing the sector. B – Fair Feasibility
B	Pelagic Fisheries Sector Development Support	Emerging Sector with many unknowns in terms of supply, market demand, costs, and income and therefore profitability/viability Fisherfolk may find lifestyle and livelihood implications undesirable / unappealing	Sub-project proposed is to support and supplement the main Pelagic WB Project – with flexible pilot approach design	A nascent sector being upgraded / scaled up with substantial unknowns. Possible upsides could be significant so worth piloting. B – Fair Feasibility
C	Ornamental Fish Farming Sector Development Support	Unrealistic expectations get raised with target beneficiaries in terms of sales income, profit margins, growth potential etc. Inconsistency in sector's development. Lack of cohesiveness and cooperation amongst farmers	Project has been designed to identify solutions to sector's existing fundamental issues – strategy, market assessment, capacity-building – by engaging the target beneficiaries from the start of the process	Some long-standing players in the market who are wise to the issues constraining the sector's development. With good leadership and team working attitudes, good progress can be made. A – Good Feasibility

Appendix 1 – Summary of Sub-Project Concept Notes

ID	NAME OF SUB-PROJECT	PARTNERS INVOLVED	BUDGET SIZE (est.)	MAIN LOCALES (initially)	KEY BENEFICIARIES
1	Farming Seaweed / Processing Sea Moss	Oracabessa Bay Foundation, Fisher Communities (Portland, St Mary), CASE, FAO	US$270k	Northern & Eastern Jamaica	Fish Sanctuaries, Fisherfolk (income Generation/Livelihoods)
2	Renewable Energy in Aquatic Applications	CMU, Jamaica Fisherman's Cooperative Union (JFCU), C-CAM, JOFFA	US$240k	South Coast & Western Jamaica	Fish Sanctuaries (cost savings) Small Fishers; New Livelihoods
3	Sustaining Fish Sanctuaries & local Fishers	Galleon/BREDS, Fishers (South Coast), JDF/Coast Guard, NFA	US$240k	South Coast & Western Jamaica	FS - Income Generation Securing ecosystems
4	Revitalise Freshwater Fish Farming (Tilapia)	HEART-NTA (Ebony Park), JFFFA, 4-H Clubs	US$200k	Inland Jamaica (Central/South)	Freshwater Fish Farmers Rural Communities
5	Livelihoods in Mangrove Conservation	Alligator Head Foundation, HEART-NTA, LOF, UWI	US$180k	Island-wide	Fisher Communities – alternative livelihoods
6	Pilot Community based Fish Farming (Basa)	CASE, Communities (Portland, St Mary, St Thomas), 4-H Clubs, NFA	US$180k	Eastern Jamaica	Rural Communities – food security / income savings

Appendix 2 – Supplemental Sub-Projects

A) SEA CUCUMBER SECTOR DEVELOPMENT

In 2017 the Government of Jamaica received support from the FAO to investigate the potential for Sea Cucumber to be developed into a viable Mariculture Sector. Several varieties of Sea Cucumber exist off the shoreline of Jamaica and the study documented these with estimations of availability numbers, providing a first step in the process of the pre-feasibility assessment on the supply side.

Prior to the FAO funded study being done, there had been harvesting of the naturally occurring "wild" cucumber for several years by an established player as the market demand from countries in the Far East came to be known. However, this harvesting activity was banned in 2015 by the then Minister of Agriculture & Fisheries, due to concerns arising from the largely unregulated activity. This curtailment of fishing activity is a recurring theme with Jamaica's marine ecosystems, necessary due to the overexploitation of natural resources, via overfishing of fish, lobster, conch etc. Indeed, it is not unique to the country, but it does pose a dangerous, existential threat to the society at large in the long run.

Building on the FAO study, the next step in the process of developing a viable Sea Cucumber Maritime Sector would be to identify the target markets and determine the viable local Business Model(s) and Sector structure by which it can function sustainably – without adverse fallout from unintended consequences.

The target market would appear to be exports to China (and the Far East) as there does not appear to be any local market consumption demand for the Sea Cucumber – save perhaps for the recent, local Chinese immigrants. This defines the Sector as an almost exclusively export-led industry, reducing the propensity for praedial theft and other illicit sector trading activity. That is not to say there will not be (temptations for) illegal activity but that Sea Cucumbers harvested will need to find their way out of the country (to be sold and so realise its monetary value) and such a supply chain will be easier to monitor, control and enforce – in theory – by the authorities. This Sector structure would therefore probably operate in a manner akin to the Queen Conch exports. (The FAO study also referenced Cuba's sector with regards to this modus operandi).

However, the FAO study also indicated a depletion of naturally occurring wild Sea Cucumber off certain parts of Jamaica's coastline – raising cause for concern. (It is not clear whether this extended the Government's harvesting ban, mentioned above). Therefore, it is doubtful that the country could rely on naturally occurring wild sea cucumber – naturally propagating - to provide a viable sector, in the present way Queen Conch and lobsters are harvested from the wild.

Ergo, the next step would be to establish a “domesticated” model with a built farming facility, for propagating this marine lifeform, from seed stock, under “controlled” conditions. (In the same way as is proposed for kick-starting the Sea Moss Mariculture Sector in Concept Note Sub-Project 1 – see Appendix 1)

This Model of building and operating a Sea Cucumber hatchery has been piloted in Madagascar and successfully replicated recently in Zanzibar (Tanzania). The Hatchery is operated by local Marine Educational and Research Institution(s) and the grow out is done by Coastal Communities for subsequent harvesting and export through controlled and regulated channels. The Jamaican Government should approach the Korean, Chinese and/or Japanese Governments, their National Development & International Funding Agencies (KOICA, SIDA etc) to seek the more significant financing and specialist expertise required for such an approach. Support and practical assistance may also be available through Social Enterprise companies such as Blue Ventures (UK).

Suitable marine farm locations would have to be identified along the Jamaican coastline where grow out could be staged with suitable criteria – good water quality, appropriate depth, cost-effective access, secure monitored sites, etc. “Ownership” of this dedicated space for such farming activity has legal implications as to validity of custodianship and commercial rights etc. which would have to be resolved.

RECOMMENDATIONS FOR ACTION

In advance of the above action, it may be useful to conduct a small-scale pilot with local stakeholders under this World Bank Programme Fund to test the practicalities of developing this sector and prove the operational Sector Model in the field. (This would be contingent on having access to adequate Sea Cucumber seed stock and successful propagation techniques).

This Jamaican Model would require the participation and support of the NFA and one or two National Institutions – such as UWI, CASE, CMU etc – who would lead in activities at the front and back end of the associated value chain. That is, supplying sea cucumber seed stock to targeted communities for grow out and then buying back the harvested matured sea cucumber for processing and sale in the export market. This is similar to the Sub-Project 1 piloting Sea Moss production and processing and could be incorporated into that said sub-project as additional “crop” being farmed, providing synergies and economies of scale.

SEA CUCUMBER SECTOR DEVELOPMENT PLAN

ID	SUB-PROJECT ACTIVITY	OBJECTIVES	OUTPUTS	PARTNERS (LEAD)	BUDGET (US$)
1	Research & define suitable & profitable Export Markets for Jamaican grown Sea Cucumbers – species, volumes, prices, quality standards, processing etc.	Identify sales channels and market opportunities which are profitable, and which offer a comparative advantage in the relevant marketplaces – Korea, China, Japan	Market Survey and Analysis (Export) Specific Sales Opportunities, Sales Volumes, Pricing & Profit Structure	JAMPRO	US$10K
2	Pilot small scale grow-out areas for sea cucumbers at suitable, protected sites off the coastline of Jamaica	Test the feasibility and practicality of developing sea cucumber cultivation to provide alternative livelihoods for Fishers	Results of grow out and propagation successes in the field with learning points and recommendations	(NFA), JFCU Fishers Communities	US$20k
			Train Fishers in the skills of sea cucumber farm management, harvesting and processing	FAO, (CASE)	
3	Identify and secure funding for design & build of a multi-species hatchery for sea cucumber	Secure necessary funds to scale up the propagation, harvesting and processing of sea cucumbers nationally	Detailed project proposal for submission to Korean, Chinese and/or Japanese Development Agencies	NFA	US$10K
	TOTAL BUDGET				**US$40k + support from Sub-Project 1**

B) PELAGIC FISHERIES SECTOR DEVELOPMENT

The development of a Pelagic Fisheries Sector in any country is a long-term process requiring substantial financing, multiple interventions, diverse skills sets and proper change management skills. It will be a multi-year programme requiring a long-term commitment and adequate funds, provided on a timely basis. In transitioning an industry sector – such as proposed by MoAF and NFA in Jamaica, moving from near-shore coral reef fisheries to off-shore areas – the challenges are not so much technical as they will be human, social, commercial, and environmental.

Being new to the actors involved – and there will be many players along the supply and value chains – the introduction of a Pelagic Fisheries Sector would be best implemented through a piloting process, learning from the experiences as they unfold and adapting the methodology and models, in real time. In addition, it would be beneficial to expose select local fishers to the experience of such off-shore pelagic fishery activity in another country – via a fact-finding experiential visit – to learn what is involved in practice. Such a visit would demonstrate to them the operational and commercial realities: practical teamwork; sharing in the commercial losses as well as the gains; exercising trust in working with others in the related value and supply chains etc.

Obviously, moving from near-shore to far-shore because the former has been over-fished does not itself correct the underlying causal issues. One could just end up, over time, also over-fishing the offshore areas. So, one should be cautious about one's expectations in making such a transition. The underlying issues typically relate to inadequate monitoring, lack of regulation of activity, managing fish stocks, scientifically calculating the estimated fish stock on a regular basis, setting appropriate fishing targets which are then actually enforced, supporting the coastal communities in a reliable and holistic manner, to name but a few.

At time of writing this report[1], there is another project (US$360k development study) funded by the WB on Pelagic Fisheries which the NFA wishes to link sub-project activity to. It is not clear at present (due to COVID19 and other constraints) whether the different project timelines will facilitate this linkage working effectively. There are risks associated with having interdependencies between said projects and delays of several months (or even more than a year due to COVID19), could arise. Inappropriate sequencing of linked project activities may result in money spent unwisely as, for example, any "premature" training may need to be repeated if trainees are not able to exercise new skills, which they learned, due to delays in the other project. Furthermore, details of the "demand side" – marketable fish products, prospective markets, prices, quality standards and sales volumes etc. - for establishing the basis of a Jamaican Pelagic Fisheries Sector will need to be determined, to confirm the competitiveness of the proposed operations to supply the domestic and/or export markets.

1 The latest available report on Pelagic Fisheries for Jamaica, provided to the author, was dated 1996, updated with comments over the years. However, it was not judged prudent to utilise it for detailed planning purposes as much has changed substantially since the last century.

RECOMMENDATIONS FOR ACTION

Nevertheless, some funding from this Sub-project WB fund has been set aside to perform the following supporting actions to this other WB project and these are summarised in the Table below:

PELAGICS FISHERIES SECTOR DEVELOPMENT PLAN

ID	SUB-PROJECT ACTIVITY	OBJECTIVES	OUTPUTS	PARTNERS (LEAD)	BUDGET (US$)
1	Implement Fishing Survey actions during pilot, engaging targeted select fishers – design and piloting	Support the Pelagic Fisheries project in their stated Activity 6.	Established Data Collection Programme and Survey Design	NFA	US$10k
		Train Fishers in the actions related to Pelagic Fisheries	Improved Pelagic Fishing protocols and trained fishers. Standardised operational and business practices. Functional and sustainable fishing enterprise	JCFU	US$30k
2	Implement data acquisition & management during Pelagic Fisheries pilot – engaging targeted select fishers	Support the Pelagic Fisheries in their stated Activity 7.	Relevant data pertaining to catches, effort, and details of fishing, costs, and revenues for each vessel. Completed logbooks	NFA	US$10k
	TOTAL BUDGET				**US$60k + support from Component 3**

C) ORNAMENTAL FISH SECTOR DEVELOPMENT PLAN

The Ornamental Fish Sector in Jamaica is still in its infancy with no clear strategic direction guiding its future development. A few players have had success in the past on a small scale, even personal, level and the local market has limited capacity for expansion in what is essentially a "hobby" based enterprise. The income from expanding this nascent sector would be primarily dependent on exports, which would be by air freight to nearby overseas markets – no more than say 4 hours away. In addition, the local sellers (small and fragments) would be at the "mercy" of more powerful buyers in these destination marketplaces. Globally, Ornamental Fish is a dynamic and changeable market and Jamaica's comparative advantage is not assured (or even clear) and so supporting this sector is a risky proposition.

The cost base of operating in this sector is disproportionately high as it includes mostly import-based costs – such as electricity, fuel, fish feed, equipment, infrastructure etc. As mentioned in other sub-projects, unless these fixed and operational costs are reduced significantly – by for example using renewable energy sources – then Jamaican Ornamental Fish Farmers will be starting from a distinct handicap in any export market opportunities. [This sub-project for the Ornamental Fish Farmer Sector will link to the Sub-Project 2 (Renewable Energy in Aquatic Applications) to benefit from the installation and demonstration of renewable energy sources such as solar power].

RECOMMENDATIONS FOR ACTION

Having said the above, providing there is a long-term commitment (8-10 years) from the Ministry of Agriculture and Fisheries and the National Fisheries Authority, the appropriate and adaptable sector strategy, adequate resources, and professional management – giving a continuity of purpose - it may be possible to eke out and develop a niche for local actors in this Sector. This forms the basis for the following project activities outlined and costed below, linking it to Sub-Project 2.

ORNAMENTAL FISH FARMING SECTOR DEVELOPMENT

ID	SUB-PROJECT ACTIVITY	OBJECTIVES	OUTPUTS	PARTNERS (LEAD)	BUDGET (US$)
1	Develop Sector Strategy Plan	Develop a sustainable Model for the Sector to ensure continued long-term success in producing and selling ornamental fish	Ornamental Fish Farm Sector: ➢ Strategic Plan ➢ Operational Plan ➢ Marketing Plan	MOAF (NFA)	US$10k
2	Sales & Marketing – Export & Local	Identify sales channels and market opportunities which are profitable, and which offer a comparative advantage in the relevant marketplaces	Market Survey and Analysis (Local, Tourism, Export) Specific Sales Opportunities, Sales Volumes, Pricing & Profit Structure	JAMPRO	US$10k
3	Capacity Building of Ornamental Fish Farmers Association	Strengthen the Association ability to support the Fish Farmers	Range of Support Services needed by members	JOFFA Dept. of Co-ops	US$20k + support from Component 3
		Skills Training for select Fish Farmers in operational and business practices	Training Programmes and Trained Fish Farmers Demonstration of solar powered pumps and systems	(JBDC), HEART-NTA MSME	US$10k + support from Sub-Project 2
			Established functioning Ornamental Fish Farmers Assn.	NFA (JOFFA)	US$10k + support from Component 3
	TOTAL BUDGET				**US$60k + support from Sub-Project 2 & Component 3**

Appendix 2a – Summary of Supplemental Sub-Projects

ID	NAME OF SUPPLEMENTAL SUB-PROJECT	PARTNERS INVOLVED	BUDGET SIZE (est.)	MAIN LOCALES (initially)	KEY BENEFICIARIES
A	Sea Cucumber Mariculture Sector Development	NFA, JFCU, JAMPRO	US$40k	National Initiative Linked to Sub-Project No. 1	Fisherfolk (Alternative Livelihoods)
B	Pelagic Fisheries Sector Development Support	NFA, JFCU	US$60k	National Initiative Linked to Pelagic Fisheries Project & Component 3	Current & Prospective Small Fishers; Wider Fisheries Sector (New Livelihoods)
C	Ornamental Fish Farming Sector Development	NFA, JOFFA, JBDC, MSME, JAMPRO, HEART-NTA	US$60k	National Initiative Linked to Sub-Project No. 2 and Component 3	JOFFA Small Ornamental Fish Farmers

Consultancy to Identify Sub-Projects on
Climate Resilient Freshwater Aquaculture, Coastal
Mariculture/Polyculture & Alternative Livelihoods

Concept Note for Sub-Project 1

"Farming Seaweed & Processing Sea Moss"

THE WORLD BANK
IBRD • IDA

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**
(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**
Government of JAMAICA

Vernon "Patrick" Barrett
March 2021

SUMMARY OF THE ACTION

Title of the Action:

"Farming Seaweed & Processing Sea Moss".

Project Partners:

- Oracabessa Fish Sanctuary – **Lead Partner**
- Fisherfolk Communities - Portland & St Mary
- College of Agriculture, Science & Education (CASE)
- Food & Agriculture Organisation (FAO)

Location(s) of the Action: — specify region(s) that will benefit from the action.
Fisher Communities and Fish Sanctuaries on north coast of Jamaica

Total duration of the Action (months): 18-24 months

WORLD BANK financing requested (amount): US$ 270,000.

OBJECTIVES OF THE ACTION

Overall objective(s)

- Establish the foundations for a sustainable sea moss farming and processing sector thereby:
    - Replenishing the wild sea moss being harvested (and in danger of depletion) through pro-active farming techniques.
    - Restoring and enhancing the damaged marine ecosystems, catalysing the return of fish life
    - Supporting Fish Sanctuaries & Fisher Communities with alternative income earning potential and livelihoods

Specific objective(s)

- Engage local fisherfolk in part-time jobs to plant, grow out, harvest and process native sea moss into value-add products for tourism & local sectors.
- Educate and train locals in the knowhow of sea moss growing and processing and its importance to the marine ecosystems.
- Diversify the livelihoods of fishers and their community through developing this agri-business sector.
- Establish the capability and knowhow of sea moss growing and processing within the CASE Institution to ensure continuity of purpose with younger generation.

Target group(s)

North Coast Cluster Zone

- Oracabessa FS – Lead Partner
- Oracabessa Fishers Assn. – 20 fisherfolk
- Cascade to FS Network via 3 new FS sites under development (Salt Marsh, Lucea, Rose Hall)
- CASE (Students and Youth Groups esp. Women)

Final beneficiaries

- Fishers & their Communities on the coast of Jamaica
- Fish Sanctuaries across Jamaica
- All users of the marine environment including hoteliers & tourism related businesses.

Estimated Results

- Fisherfolk provided with part time jobs from project execution activities (20)
- Fish Sanctuaries establish 3-4 Sea Moss farm sites on/near their premises.
- An emerging Sea Moss Sector with additional associated livelihood opportunities
- The foundations for a larger value-addition sea moss industry – drinks, spa products etc.

Main Activities

ORACABESSA FISH SANCTUARY

- Acquire sea moss farming expertise via FAO from recent Sea Moss Sector Development (E. Caribbean)
- Educate and train local beneficiaries, with support from FAO & CASE, via field farming schools.
- Establish a pilot demo farm at sea to grow sea moss at FS.
- Build out the infrastructure in 3-4 Fish Sanctuaries and plant out the Sea Moss.
- Nurture the growth of the planted Sea Moss to enable regular harvesting.
- Harvest the Sea Moss and process it to first stage (drying) value add.
- Demonstrate the conversion of dried Sea Moss into semi-finished and/or final products – drinks, spa products etc. for sale locally (tourists and locals)
- Incorporate the sector knowhow and competence into Institutions (CASE)

COLLEGE OF AGRICULTURE, SCIENCE & EDUCATION (CASE)

- Establish a sea moss nursey at the CASE Campus.
- Supply the Oracabessa Fish Sanctuary with seed & cuttings for propagation purposes.
- Develop the curriculum and courses to teach sea moss farming and value addition to students.
- Outreach to local communities to raise awareness about the sea moss sector being developed.
- Facilitate the development of alternative livelihoods based around the emerging sea moss sector.

FOOD & AGRICULTURE ORGANISATION

- Provide sub-project real world experience and expertise derived from recent similar actions in Eastern Caribbean (CC4FISH – Climate Change Adaptation of the Eastern Caribbean Fisheries Sector)
- Deliver Sea Moss Production Training and Value Addition Workshops for beneficiaries (20)
- Support the Fish Sanctuary and CASE with integrating and embedding Sea Moss Programme into Institutional framework

DESCRIPTION OF THE ACTION

Background to the Action.

Sea Moss grows as an indigenous marine life form off the coast of Jamaica and has a long-standing popularity with the local population who use it make drinks and other products, reputed to provide acclaimed health benefits. However, this sea moss, which grows wild, has been harvested for decades, if not centuries, with no corresponding, pro-active restoration or replenishment by its consumers by, for example cultivated farming.

There is anecdotal evidence that this marine plant is in danger of being depleted through such human activity and that the COVID19 pandemic has increased harvesting levels, leading to scarcity in the local markets – such as in downtown Kingston. This is evidenced by sea moss prices, in this informal market trading, increasing from JA$400 per lb to JA$2,000 per lb in said market, during late 2020. Furthermore, recent attempts by the Oracabessa Fish Sanctuary to acquire live, wild samples of the sea moss for propagation purposes took an unusually long period of time, extensively searching far and wide along the northern coast of Jamaica.

The current model of uncontrolled harvesting sea moss for local trade in unsustainable and the precedents witnessed in recent years with Queen Conch makes it advisable that the authorities take the lead to monitor and regulate this activity and simultaneously create alternatives for meeting this market demand by the establishment of sea moss farms. The market potential of growing the local sea moss is evidenced by the existence of several “staple” sea moss drinks produced, canned, and sold by the Grace Kennedy company and others (presumably using overseas inputs). Yet depletion of wild growing sea moss will impact the inter-dependent marine life and eventually contribute to the destruction of the marine ecosystem including fish and plant life. This sub-project seeks to pioneer the formal development of the sea moss sector in a positive constructive manner to address this conflict of traditional livelihood, market demand and environmental pressures.

In discussions held with CASE, interest has been shown to take an Institutional lead in introducing a sea moss sector, in the first instance acting as a nursery for its propagation, by working in conjunction with the Oracabessa Fish Sanctuary. CASE is also well positioned to act as a facilitator for Community-based economic activity leading to alternative livelihoods in this new Mariculture Sector of the Blue Economy - growing, harvesting, and processing of sea moss.

The cultivated farming of Sea Moss is not without its challenges. It has been tried previously in Jamaica over the years - including by Fish Sanctuaries whose locations provide a suitable secure, natural, healthy environment – but, alas, with little significant success. This is in contrast with the successful sea moss sectors developed in St Lucia and Belize which can provide learning points and possible options for a Jamaican industry models. The ongoing CC4FISH programme, led by the FAO, in Eastern Caribbean offers potential transferable knowhow and expertise and discussions with them have led to their inclusion as an important Partner in this proposed sub-project.

In addition to the FAO and CASE, several discussions were held with the Oracabessa Fish Sanctuary and they were keen to act as Lead Partner in this sub-project. Further details about their role are carried in the sections below.

Objectives of the Action

The Key Objective of this sub-project is to create a foundation for the sustainable development of sea moss farming sector in Jamaica through an adequately resourced, enabled, appropriate Partnership action. The sub-project brings together organisations and people with the relevant experience, expertise, and infrastructure to deliver this challenging but necessary, transition.

The establishment of an organised sea moss farming sector will create new jobs and livelihood opportunities for those in nearby coastal communities including fishers and their families. Successful sea moss cultivation can also help other marine life to recover, providing a multiplier effect through stimulating fish and other marine life to flourish.

Key Stakeholder groups, their attitudes towards the Action

Oracabessa Fish Sanctuary

Oracabessa Fish Sanctuary (FS) confirmed its role as the Lead Partner and several discussions were held with Mr Inilek Wilmott to detail their role, activities, and costs of participation in the sub-project. This FS is aware of the issues involved and have had intentions to pursue sea moss farming production in their plans for some time but were constrained by inadequate resources and knowhow. It is excellently positioned to deliver the implementation with its strong, established relationships with both the adjoining Fisher Communities and tourism actors. Its proximity to CASE, Kingston, and the resort areas of the north coats, via excellent transportation links will also be to its advantage. It has a good track record of managing and delivering funded projects of this kind.

CASE

Discussions were also held with Dr Derrick Deslandes, President of CASE, in the preparation of this Concept Note and again his enthusiastic contributions were incorporated into its content and approach. The Mariculture domain has been of growing interest to CASE in recent years and it builds on their expanding capabilities in both the farming and aquatic sectors. They have an ideal location and profile to deliver the Institutional capacity building required to engage the younger generation, coastal communities, and tourism interests. This is needed to ensure this incipient action is anchored for current and future generations in a sustainable manner.

FAO

Several discussions were held with FAO locally in Jamaica and in the Caribbean region to research the status of its actions in the Sea Moss project (in the Eastern Caribbean) which could leveraged to deliver the outcomes of this proposed sub-project in Jamaica. Dr Iris Monnereau – FAO Caribbean Regional Coordinator for CC4FISH - provided the necessary information, advice and costings and linkages to the key personalities within FAO. These helped to shape the design and approach of this Concept Note.

Type of Activities and related Outputs and Results

The three key Partners (Oracabessa Fish Sanctuary, CASE & FAO) between have the necessary complement of skills, experience, and expertise to execute the necessary activities for achieving the sub-project's stated objectives.

The FAO will provide the expert personnel to design and deliver the training necessary to the targeted beneficiaries in the following areas for Sea Moss Farming:

- Sea Moss Production
- Plant selection
- Growing and Farm Management
- On farm Food Safety
- Preliminary Processing – Drying

The FAO will share their experiences and learnings from the recent FAO programmes with Sea Moss in the Eastern Caribbean under the CC4FISH Programme. They will work with both the Oracabessa Fish Sanctuary and CASE in these knowledge-sharing and training activities.

CASE will acquire and stock sea moss cuttings at its campus site in Portland to act as a designated nursery and reservoir for supplying the growing out by third parties - initially the Oracabessa FS. It will incorporate the knowledge for this new sector into its curriculum offering, integrating the relevant knowledge learned from the project's FAO workshops and its own subsequent local field activity.
CASE will also subsequently support the FS and local communities in the processing of sea moss harvested into value-added products. This will include product and market development and sales to third parties such as tourist resorts. The development of related supply chains and appropriate business models will be explored starting with the existing traditional users of the reaped and dried sea moss. If time and resources permit under this sub-project, then CASE will also grow out sea moss from its own nurseries into a farm site prepared offshore to its coastal campus.

The Oracabessa Fish Sanctuary will provide the Lead role to the project – serving as the first Fish Sanctuary to pilot the growing out of sea moss. A farm site will be prepared at its location using the equipment bought from the project funds – ropes, anchors etc. Its own staff and others employed from nearby Fisher Communities will do the necessary work to build the infrastructure on which the sea moss will grow out. The team thereby constituted will manage and tend to this farm and at the appropriate time harvest the sea moss crop. This cycle will be repeated several times over the life span of the project and learning / fact-finding visits from other interested FS are anticipated during the project life cycle. This will ensure transfer of knowledge and experiences and will be facilitated through the existing Fish Sanctuary Network. It is anticipated that the foundations of sea moss farm established at the Oracabessa Fish Sanctuary (and CASE potentially) will be replicated in other FS around the island's coastline.
During the project, the Oracabessa Fish Sanctuary will support nearby Fishers and their communities with skills training related to the sea moss sector development. These include water-based skills needed to operate out at sea in the different phases of the sea moss planting, farm management and harvesting. This will form the basis of new alternative livelihoods for these target groups.

State the broad timeframe for the action and describe any specific factor that has been considered.

Under normal circumstances the actual time required for the execution of this project should be 18 months but, given the current COVID19 pandemic context and the likely future scenarios, a longer elapsed period of 24 months should be allocated during which to deliver the outcomes and outputs – with people working on a part-time.

APPENDIX 1 – PROPOSED BUDGET

PROJECT PARTNER	ITEM DEFINITION	BREAKDOWN (US$)	AMOUNT (US$)
ORACABESSA FISH SANCTUARY	Project Staff Time (Part-time) & Operating Costs over 2 years	67,600	**119,200**
	Land based Capital costs	33,500	
	Set-up open water infrastructure	6,000	
	Knowledge Exchange Activities	6,000	
	Media Creation Actions	6,100	
COLLEGE OF AGRICULTURE, SCIENCE & EDUCATION (CASE)	Staff Support to project (Part Time)	15,000	**50,000**
	Coordination, Engagement & Dissemination activity	8,000	
	Faculty support for curriculum and course development	12,000	
	Capital Costs to build infrastructure	15,000	
FISHERFOLK COMMUNITIES	Trainees Support – stipends etc	20,000	**40,000**
	Equipment for skills training	10,000	
	Trainers Costs	10,000	
FAO (United Nations)	Services over an 18-month period to implement Sea Moss Farm pilot and train beneficiaries	60,800	**60,800**
	GRAND TOTAL COSTS (over 2 years)		**270,000**

Consultancy to Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture & Alternative Livelihoods

Concept Note for Sub-Project 2

"Renewable Energy Applications in the Blue Economy"

THE WORLD BANK
IBRD • IDA

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**
(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**
Government of JAMAICA

Vernon "Patrick" Barrett
March 2021

SUMMARY OF THE ACTION

Title of the Action:

"GREENING THE BLUE ECONOMY"

Renewable Energy Applications in the Blue Economy

Project Partners:

- Caribbean Maritime University (CMU) – **Lead Partner**
- Fish Sanctuary Network Lead Member (C-CAM)
- Jamaica Fisherman Cooperative Union (JFCU)

Location(s) of the action: — specify region(s) that will benefit from the action.

- Portland Bight Protected Area
- Montego Bay Marine Park
- Galleon / BREDS
- Negril Marine Park

Total duration of the action (months): 24 months

WORLD BANK financing requested (amount): US$ 240,000.

OBJECTIVES OF THE ACTION

Overall objective(s)

- Catalyse the progression of renewable energy use in the maritime & fisheries sectors as part of addressing the Climate Change Agenda
- Build local skills capabilities & alternative livelihood opportunities for fisherfolk the GREEN AGENDA transition
- Demonstrate the practical use of GREEN ENERGY - electric boat engines and solar power systems - in Fish Sanctuary operations to improve quality of the environment and restore marine ecosystems.

Specific objective(s)

- Create demonstration Green Energy pilot sites at selected Fish Sanctuaries & Marine Parks by introducing electric boat engines (as appropriate functionality permits)
- Create new job opportunities & viable livelihoods in the fisherfolk communities in the Green Agenda with skills training in renewable energy applications (design, installation, maintenance, etc)
- Facilitate cost savings to operations of the Fish Sanctuaries (and some fisherfolk) where it is feasible to switch to renewable/green sources, such as Solar Power systems
- Provide cost-effective power supply to selected Fish Sanctuary base facilities.
- Operate chill storage areas cost-effectively at selected Landing Sites for Fishers

Target group(s)

Select Fish Sanctuaries & Marine Parks

- Portland Bight Protected Area (C-CAM): Salt Harbour, Galleon Harbour, Three Bays FS
- Galleon / BREDS
- Montego Bay Marine Park / Negril Marine Park

Final beneficiaries

- Fisherfolk Communities on Southern and Western coast of Jamaica
- Fish Sanctuary Network via knowledge sharing.

Estimated Results

- Three (3) Fish Sanctuaries / Marine Parks supplied and operate electric boat engines with individual, portable, recharging solar panels.
- Solar panels and equipment installed at 2 sites (min.) for supply of required sized kWh.
- 30 Fisherfolk provided with jobs skills training (solar/electric) from project execution activities

MAIN ACTIVITIES

CARIBBEAN MARITIME UNIVERSITY (CMU)

Renewable Energy (Solar Power) for Fish Sanctuary Sites

- Design, procure and install solar power facilities for selected Fish Sanctuaries (minimum 2)
- Commission and provide ongoing skills training and support for these facilities.
- Ensure back-up power systems by interchange with mains supply and/or battery back-up.
- Design and build prototype solar power chill facilities for fish storage by fishers.

Introduction of Electric Boat Engines for Fish Sanctuary Sites

- Specify requirements and procure sample electric boat engines for Fish Sanctuaries (minimum 3) – working through the Jamaica Fisherman Cooperative Union (JFCU)
- Pilot the use of demo electric boat engines in Fish Sanctuaries where engine specification meets user requirements (fit for purpose)
- Video- tape and Cascade the knowhow to targeted beneficiaries via Institution program.

Skills Training for Fisherfolk Communities

- Train FS personnel (6-9) and fisher community members (30) in the installation, operation and maintenance of electric boat motors and solar power systems

C-CAM FISH SANCTUARY

- Provide learning from the previous experiences with own solar systems / electric motors.
- Support CMU in the installation of solar powered systems in selected Fish Sanctuaries.
- Facilitate the introduction/demonstration of electric boat engines in FS's through network.

JAMAICA FISHERMAN COOPERATIVE UNION

- Develop commercial relations with potential electric boat engine suppliers.
- Develop capability to build/operate chill storage facilities for fish catch storage with CMU.
- Work with Cooperative Members to disseminate the knowledge and expertise to wider Fishers groups.

DESCRIPTION OF THE ACTION

Background to the Action.

The maritime and fisher community in Jamaica almost exclusively use petrol / diesel boat engines to power their traditional boats in common with the historical evolution of the sector. The Fish Sanctuaries also use such boat engines although most of their activity is within a defined, confined space, which is close to the coastal shoreline of the country.

For the small fisherfolk the costs of fuelling such engines are a large component of their operating, variable costs are significant, relative to their income derived from any fish catch. The nature of their fishing enterprise is also inherently risky. They must first buy petrol fuel, before going out to test their fortunes at sea, without knowing if and what they will catch to sell, as a return on their investment in this fuel. Such fishers are facing growing financial pressures on two fronts:

- The effort they must expend (time, fuel, wear, and tear) to catch the same volume of fish is increasing due to declining fish populations and competition.
- The cost of fuel (an US$-denominated imported product) is variable with global price trends but tends to increase over time with a creeping devaluation of the Jamaican dollar.

It is anticipated that there will be some reluctance to move from “higher” powered petrol boat engines to the quieter, low profile electric motors by some fisher folk. Indeed, some fisher requirements will not be met by electric boat engines (such as long-distance travel in adverse weather) and so this intervention is not targeted directly at them for now.

However great strides have been made in the use of electric boat motors in recent years, globally, and the practicality of using such technology in maritime vessel applications is rapidly accelerating. By charging these boat engines from solar sources the costs of operating are greatly reduced, as is the cost of maintenance. Lower horse-power electric engines have gained wide acceptance by maritime users as a proven alternative in certain marine domains. Their use is even compulsory in some marine protected areas. Their other benefits include eliminating pollution (air and water) from hydrocarbon fuel sources and less disturbance of marine life (largely silent operation).

The immediate application for electric boat engines in Jamaica – where small HP engines are adequate and fit-for-purpose – would be in targeted Fish Sanctuaries & Marine Parks, starting with Galleon, Negril & Montego Bay Marine Parks. The application and use of electric boat engines will provide impetus for the “green” transition required, by demonstrating their successful operation to others, such as fisherfolk.

The other high costs of operating relate to the use of electricity from the national grid, provided currently by the JPS company. Fish Sanctuaries currently pay between JA$1-2 million per year for their utility bills and again the trend is an increase in this operating cost, year on year. A couple of Fish Sanctuaries (such as those operated by C-CAM) have benefitted in the past from previous funded projects to install solar panels to supplement/displace their JPS mains supply. This benefit will be extended to other Fish Sanctuaries experiencing financial pressures, under COVID19 context, to reduce their operational costs and support their sustainability.

Neighbouring Fisher communities will also be supported within this initiative by provision of solar powered chill/freezer facilities which will help them to reduce wastage of their fish catch.

Objectives of the Action

The objective of this sub-project is to strengthen the resilience of target coastal communities to Climate Change Actions through the introduction and propagation of renewable powered energy systems. These (off-grid) solar powered office facilities and (rechargeable) electric boat engines will also reduce the operational costs of their users, better sustain their financial security, diversifying livelihoods, and improve the quality of the marine environment through reduced air, water, and noise pollution.

Key Stakeholder groups, their attitudes towards the Action.

Caribbean Maritime University (CMU)

The Blue Economy & Innovation Centre at the CMU has substantive, direct experience with the installation and use of solar panel powered systems on its Kingston maritime campus over recent years. Its Executive Director – Mr Joachim Schmillen – has been consulted with extensively in the preparation of this proposal and is fully committed to its objectives and future implementation.

Mr Schmillen was involved with the German Aid funded project (November 2014) which installed solar panels at Salt River (Portland Bight) for the Fish Sanctuary there and has first-hand knowledge and experience of such an action.

Mr Schmillen also has personal first-hand experiences with operating and maintaining electric motor engines for boats and contact with overseas suppliers of such equipment.

C-CAM

The Fish Sanctuary at Salt River (managed by C-CAM) has benefitted from a previous project in 2014 where solar powered facilities were installed on its premises. The learning from this experience will be applied to install another such facilities at Galleon (BREDS) and Montego Bay Marine Park. The C-CAM Director – Ms Ingrid Parchment - has been extremely helpful in providing some preliminary background information in this regard and has expressed strong interest in partnering with CMU on this project, as the representative Lead organisation for the Fish Sanctuary Network in Jamaica.

JFCU

The JFCU is a well-established organisation serving the needs of Fisherfolk providing a source of supplies which the communities use in the conduct of their livelihoods, including boat engines, boats, fishing supplies and accessories. It is therefore well established to support the fisheries sector in its transition to Green technologies in the Blue Economy – solar power, electric boat engines etc.

The Union has 10 Cooperatives as Members and each of these have on average 100 fishers are individual members. Discussions were held with Ms Ionie Henry and Mr Glaston White representing the JCFU and they expressed interest in playing a supporting role for the project's implementation.

Types of Activities proposed, related Outputs and Results.

Purchase and installation of 2,500 Watts / 48-volt solar power systems for 2 (or 3 if finances permit) Fish Sanctuary site offices. One such office in the Montego Bay Marine Park Area and the other in the Galleon (BREDS). If funds permit the third will be at the Negril Marine Park area. Estimated cost is US$15,000 each site – installed with battery back-up supplied.

Purchase, installation, and operation of 3 electric boat motors for 3 different Fish Sanctuary Sites:

- One for Montego Bay Marine Park,
- One for Galleon/BREDS,
- One for Negril Marine Park.

The initial specification is for one (1) 10HP ePropulsion motor and two (2) 20HP Elco motors. Estimated total cost for these 3 motors is US$15,000.

Working with the selected Fish Sanctuaries, CMU will conduct an initial Audit to confirm of the Needs Assessment of the energy consumption, power applications and usage patterns of their premises and operations – in office and on the water. This Audit will also examine the experiences of CCAM with renewable energy to provide learning points to guide the design, implementation of new renewable energy units.

Training workshops and education sessions with Cooperative Union staff in the areas related to these renewable energy technologies. JCFU have 10 Coop Members and they have in turn about 100 each. Train 5 fishers from each Coop through the JCFU making a total beneficiary trainee group of 50 people.

State the broad timeframe for the action and describe any specific factor that has been considered.
The project will be scheduled to be completed in 24 months to allow for the COVID19 pandemic context. However, efforts will be made to complete within 18 months, if changing conditions make that possible.

APPENDIX 1 – PROPOSED BUDGET

PROJECT PARTNER	ITEM DEFINITION	BREAKDOWN (US$)	AMOUNT (US$)
CARIBBEAN MARITIME UNIVERSITY (CMU)	Project Staff Time (Part-time)	40,000	**150,000**
	Faculty Time (Part Time)	10,000	
Galleon/BREDS	Electric Motor Engines	15,000	
Montego Bay / Negril	Solar Power Systems	45,000	
Fisher Communities Training	Beneficiary Activities Expenses	20,000	
	Operating Costs (2 years)	20,000	
C-CAM – Fish Sanctuary Network Lead	Staff Support to project	15,000	**40,000**
	Capacity build FS Network	15,000	
	Operational Expenses	10,000	
JAMAICA FISHERMANS COOP UNION	Staff Support	20,000	**50,000**
	Capacity Building Activities	10,000	
Fisher Communities Demonstration	Chilled Storage (Fishers)	20,000	
	GRAND TOTAL COSTS (over 2 years)		**240,000**

Consultancy to Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture & Alternative Livelihoods

Concept Note for Sub-Project 3

"Sustaining Vulnerable Fish Sanctuaries"

THE WORLD BANK
IBRD • IDA

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**
(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**
Government of JAMAICA

Vernon "Patrick" Barrett
March 2021

SUMMARY OF THE ACTION

Title of the Action:

"SUSTAINING VULNERABLE FISH SANCTUARIES"

Project Partners:

- Galleon / BREDS Fish Sanctuary Foundation – **Lead Partner**
- Fish Sanctuaries nearby (Long Acre & Parottee)
- National Fisheries Authority
- Coast Guard / JDF

Location(s) of the Action: — specify region(s) that will benefit from the action.

- Long Acre / Crawford
- Parottee
- Galleon Fish Sanctuary

Total duration of the Action (months): 18-24 months

WORLD BANK financing requested amount: US$ 240,000.

OBJECTIVES OF THE ACTION

Overall objective(s)

- Ensure sustainability of Fish Sanctuaries with permanent physical presence, greater cost-effective security measures, lower operating costs, and diverse income streams.
- Design and implement a cost-effective **Integrated Security System (ISS)**, using appropriate technologies to ensure better 24/7 security of the Fish Sanctuary domain.
- Enhance livelihood prospects for Fisher community members with opportunities in tour guiding, videography, photography, eco-tourism applications.

Specific objective(s)

- Pilot **Integrated Security System (ISS)** model for Fish Sanctuaries using Galleon FS / BREDS, working with adjacent Fishers communities at Long Acre and Parottee.
- Train beneficiaries (FS Staff & selected Fishers) in additional skills sets related to Security Services Provision and Audio-visual equipment knowhow (Camera cell phones, Go-Pros, etc)
- Monetise the latent economic potential of FS – developing additional income from tourism related excursions / attractions linking to resort areas, customised souvenir item productions from a/v inputs,

Target group(s)

- Crawford / Long Acre / Parottee Fisherfolk Communities
- Galleon Fish sanctuary
- Fish Sanctuary Network Members
- Green Island (replicated on North Coast, funds permitting)

Final beneficiaries

- All Jamaican Fish Sanctuaries
- Fisher Communities island wide

Estimated Results

- A fitted & secured office at Galleon using a converted 40 ft sea container on tenured land.
- An **Integrated Security System (ISS)** model for Fish Sanctuaries piloted at Galleon FS.
- Improved rates in - Detection, Recording, Interdiction, Prosecution – of FS offenders
- Greater adoption of multiple modern affordable security application technologies in Blue Economy domains island wide
- Increased collaboration by FS with JDF, Coast Guard, Security firms, Mobile Phone operators
- Upgraded skills sets re security roles in marine environments, giving alternative livelihoods.
- Stronger relationships between FS and neighbouring Fisher Communities

Main Activities

GALLEON FS/BREDS

Office Premises – Self-contained with solar power

- Identify and confirm the location for a secure office base with lease tenure arrangements (at present there is no local office site)
- Design the layout of the container office (40 ft) – replicate office at Oracabessa Fish Sanctuary
- Procure the container office and install on selected, tenured site (leased Government lands)
- Install solar panels to ensure adequate, affordable electricity to FS container office (linkages to sub-project no. 2)

Security

- Liaise with security experts (JDF, Coast Guard, Private Security Firms, Telecoms Companies) to design and implement a model for Integrated Security System for a Fish Sanctuary site
- Procure the necessary equipment – proximity alarms & remote wireless cameras on buoys, drones, infra-red trip cameras, Wi-Fi – to monitor, detect, record, interdict & prosecute offenders in FS domain.
- Integrate the different operations & technologies to efficiently and cost-effectively a 24/7 secure FS.
- Train selected beneficiaries in marine related security operations for alternative livelihoods.

Alternative Income Generation

- Design and implement proposed Tour Excursions and Attractions for financial income to FS & enhance livelihoods to local Fisher Communities.
- Procure modern kayak boats for use with new excursions in Fish Sanctuaries.
- Work with BREDS partners to educate and train FS staff and locals in videography and photography skills and make a/v productions for YouTube Channel (Go Pros, Camera Phones)
- Develop programme of producing Fish Sanctuary souvenir items for sale to FS visitors and online e.g. by procuring required T-shirt embossing/printing equipment, a/v editing software
- Design and build a boardwalk to sensitively access bordering mangroves for tours.
- Arrange and manage training of fisher beneficiaries in tourism related opportunities – security, scuba diving, tour guiding (land and sea), memorabilia & souvenirs.

FISHER COMMUNITIES (MEMBERS)

Identify 30 beneficiaries (total) from the nearby Fisher Communities (Long Acre, Parottee) to receive training and support for:

- Leading as Tour Guides on the water excursions (3-seater kayaks)
- Audio-visual training (camera phones, Go Pros, editing and uploading on Social Media platforms such as YouTube)
- Design & Production of customised souvenir/memorabilia items
- Other alternative Livelihood opportunities arising from project.

NATIONAL FISHERIES AUTHORITY

- Coordinate and manage the interaction between various Government entities with the Galleon Fish Sanctuary – e.g., JDF Coast Guard security measures.
- Design the integration of the security of all Fish Sanctuaries nationwide, using affordable third-party, Satellite-based services available to provide economies of scale (see Mona GeoInformatics for more information and support)
- Replicate the model development of an office site at Galleon with other Fish Sanctuaries / Fisher communities (for example Green Island) using a converted container office.

JDF COAST GUARD

- Advise Galleon/BREDS in the design & development of an **Integrated Security System (ISS) t**o Monitor, Detect, Record, Interdict & Prosecute offenders in its Fish Sanctuary area
- Assist in the installation and operation of the various modern equipment and technology which will constitute such an **Integrated Security System (ISS)** – wireless infrared cameras, buoy proximity alerts, Wi-Fi network, drones, boat mobile communications, CCTV monitors & recorders, motion detectors and alarms, satellite-based services etc.
- Support the initial commissioning and operation of such an ISS system.
- Liaise with NFA, regarding the future roll-out to other Fish Sanctuaries island wide, of the ISS pilot at Galleon (once operational and proven) to create a Modern Integrated Security System Network (MISSN).

DESCRIPTION OF THE ACTION

Background to the Action.

Adequate provision of Monitoring, Controlling, Surveillance & Evaluating (MCSE) capability is critical for the successful restoration of marine ecosystems and the revival of fish/marine life stocks in the surrounding seas. This has been highlighted during the recent, ongoing COVID19 pandemic where increased incursions were reported by some Fish Sanctuaries in the country due to the economic stresses on local coastal communities and others and the absence of 24/7 coverage of the domain due to limited FS financial resources.

Fish Sanctuaries need additional resources (Technology, Equipment, Skills, Methods) to comprehensively, and cost-effectively, secure their marine domains on a 24/7 basis. Through a combination of using the latest, affordable wireless technologies available and designing systems and methods it will be possible to implement an appropriate customised **Integrated Security System (ISS),** which can be replicated across other Jamaican Fish Sanctuaries, going forward. This will require the involvement and support of appropriate security experts such as the JDF, Coast Guard and/or Private Security Firms.

With recent advances in security technologies globally it has become possible to design, develop and deploy an integrated security system which uses drones, satellite-based services, proximity sensors, infra-red CCTV, Wi-Fi technology, in marine zones to monitor, record and identify offending parties. This can be backed up with actual interdiction and detention as required by use of manned boat vessels.

Such boat vessels have been recently acquired by the Ministry of Agriculture and Fisheries for the specific purpose of patrolling the Jamaican coastline to monitor and secure these targeted waters. However, these boat assets are expensive to operate and maintain, with variable response times, as they will be covering vast areas at sea. Patrol Boat utilisation will require the application of intelligence-gathering measures and incorporation into a wider Integrated Security System to be optimally deployed to cover the large sea spaces cost-effectively.

Supporting information-gathering and monitoring (surveillance) technologies involving Drones and Satellite are in their early stages of adoption in Jamaica and this needs to be accelerated and integrated into a holistic security solution. For example, some Fish Sanctuaries in Jamaica are currently in the planning stages of exploring the use of aerial drones on their own for such surveillance purposes. In addition, Mona GeoInfomatics is currently accessing affordable (and sometimes free) satellite-based services from third parties in other funded, marine-based projects (Kingston Harbour). However, these applications are being used in isolation which will not provide maximum impact for the detection and prevention of offending parties in FS domains.

Many Fish Sanctuaries are operating on a “shoe-string” budget of insecure funding sources with limited diversification. Additional income generation is needed to diversify the risk of FS underfunding & ensure resilience through difficult periods. This can be addressed by greater monetisation of the natural asset that is the Fish Sanctuary through tourism-related activities, services, and products (see below). Concurrently, the relationship building between Fish Sanctuaries and Fisher Communities, which has been developing positively over recent years needs to strengthen, despite the challenging circumstances of the country’s wider socio-economic context.

Objectives of the Action.

The Key Objective of this sub-project is to provide a "proof-of-concept model" for an **Integrated Security System (ISS), designed and piloted** at Galleon Fish Sanctuary (BREDS).
This Security System can then be rolled out to all Fish Sanctuaries across Jamaica, at a future date with support from third parties, to become a **Modern Integrated Security System Network (MISSN).**

However, the Galleon Fish Sanctuary is currently without a dedicated office premises on site in Long Bay/Crawford. This limits the Sanctuary's ability to operate effectively and efficiently, being unable to earn additional revenue through "monetising" its natural environment and ecosystem with additional "visitor experience" services and products. The sub-project will therefore first secure a permanent office presence for Galleon FS at its site, located on leased Government lands.

The other objectives of the sub-project will support the diversification of income generation for the FS and, in tandem, provide alternative livelihoods for the neighbouring Fisherfolk Communities by leveraging the value of natural assets of the marine ecosystems and its strategic location near Treasure Beach, Black River and the popular Pelican Bar. This will involve procurement of specific equipment and the build out of existing physical infrastructure at the Sanctuary as described in the Section on Activities below.

Key Stakeholder groups, their attitudes towards the Action

BREDS / Galleon Fish Sanctuary

The Galleon Fish Sanctuary (managed by BREDS, Treasure Beach) has been operating successfully for about 10 years. It has a good strong relationship with BREDS which in turn has excellent relationships with neighbouring and coastal fisher communities, including Pelican Bar.
Discussions with Mr Luke Ben Brown and Mr Jason Henzell contributed to the development of this Sub-Project Concept Note, identifying key issues, opportunities and threats related to this Fish Sanctuary. Initial costs for developing the estimated budget costs for this initiative were also formulated in conjunction with them. They were both enthusiastic and committed to participating in this proposed action and in engaging with known end beneficiary fisherfolk in the targeted, nearby fisherfolk communities to deliver its results.

NATIONAL FISHERIES AUTHORITY

At the outset of the assignment, Ms Smikle (NFA) had emphasised the importance of Monitoring, Controlling, Surveillance & Evaluating (MCSE) capability in delivering the overall objectives of the World Bank programme. This sub-project will facilitate and fund the active participation of the NFA in furthering the security of marine ecosystems and the integration of the coastal Patrol Boat vessels into MCS&E activity island wide. The specific details of its involvement will need to be confirmed in the next stage of project proposal development. However, it is anticipated that the NFA role will include coordination of activities between Galleon/BREDS and third parties (such as the Coast Guard/JDF) and for the nationwide adoption of the marine security best practices, developed at the Galleon FS, to other Jamaican FS via the FS Network.

Type of Activities proposed, related Outputs and Results.

The Oracabessa Bay Fish Sanctuary has been using a converted 40ft container as their office premises for over 5 years or so and this has provided a useful model to be replicated by Galleon Fish Sanctuary in this sub-project.

Galleon FS has never had a physical office presence at its coastal location near Long Bay/Crawford and has been using the premises kindly provided at BREDS Treasure Beach, which is some 20 miles distant. One of the first activities will be for Galleon FS to work with qualified suppliers to design, procure and install a refurbished 40 ft. sea container to serve as its "permanent" but portable office. This office will be outfitted with solar panels to provide an affordable electricity source and this will be sourced from sub-project 2 – GREENING OF THE BLUE ECONOMY (CMU).

The FS will also work with third party security expert providers to design, develop, and implement an Integrated Security System to monitor its marine and land space of the Sanctuary. The existing marker buoys will be refurbished and used as floating platforms on which to attach appropriate proximity sensors, remote wireless cameras, and other affordable modern technology devices to safeguard the perimeter of the Sanctuary. These will be connected via Wi-Fi to recording devices and monitoring screens at a remote location, probably the new container office and/or BREDS offices.

The FS has an urgent need to diversify its sources of income to fund its operational budget. This will be accomplished through the acquisition of items which can facilitate eco-tourism related services and products. These include kayaks, cameras (Go Pro's, Drones etc), T-shirt printers for customised memorabilia and souvenirs, photo, and video editing software. There will also be the building of a mangrove boardwalk and/or gazebo to enable interesting mangrove-based tours with bird watching, flora and fauna spotting, and shooting of videos/photos.

Such activity will create alternative and supplemental livelihoods for Fishers, and they will be trained, as part of the sub-project activities, in the relevant skills such as: tour guiding, kayaking, snorkelling, scuba diving, lifesaving, the use of audio-visual technology, internet social media earning skills, photo and video production.

State the broad timeframe for the action and describe any specific factor that has been considered.

Under normal circumstances the actual time required for the execution of this project should be 18 months but, given the current COVID19 pandemic context and the likely future scenarios, a longer elapsed period of 24 months should be allocated during which to deliver the outcomes and outputs – with people working on a part-time (and probably start-stop basis).

APPENDIX 1 – PROPOSED BUDGET

PROJECT PARTNER	ITEM DEFINITION	BREAKDOWN (US$)	AMOUNT (US$)
GALLEON / BREDS	Project Staff Time (Part-time)	25,000	**180,000**
	Office Container (40 ft) refurb & install	31,200	
	Security Equipment (alarms, cameras, software, CCTV monitors etc) including installation	35,000	
	Mangrove-based tour infrastructure (Boardwalk)	66,000	
	Eco-Tour items & equipment (5 Kayaks & FS Boat)	16,420	
	Cameras (Go Pro's, Drones) & video software	6,380	
	Beneficiary Activities Expenses – Alternative Livelihoods Training	See Below under Fisherfolk	
NATIONAL FISHERIES AUTHORITY	Staff Support to project	10,000	**20,000**
	Coordination activity with Security Providers to set-up ISS	5,000	
	Dissemination to other FS	5,000	
FISHERFOLK COMMUNITIES	Trainees Support – stipends etc	20,000	**30,000**
(Long Acre & Parottee)	Trainers Costs	10,000	
COAST GUARD/ JDF / SECURITY FIRMS	Security advisory services to design Integrated Security System (ISS)	10,000	**10,000**
	GRAND TOTAL COSTS (over 2 years)		**240,000**

Consultancy to Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture & Alternative Livelihoods

Concept Note for Sub-Project 4

"Revitalising Freshwater Fish Farming Sector"

THE WORLD BANK
IBRD • IDA

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**
(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**
Government of JAMAICA

Vernon "Patrick" Barrett
March 2021

SUMMARY OF THE ACTION

Title of the Action:

"Revitalising Freshwater Fish Farming Sector".

Project Partners:

- HEART-NTA (Ebony Park) – LEAD PARTNER
- Jamaica Fish Farmers Association (JFFFA)
- 4-H Clubs
- National Fisheries Authority

Location(s) of the Action: — specify region(s) that will benefit from the action.

- Rural inland Jamaica (South & Central Regions)
- Ebony Park environs & neighbouring communities

Total duration of the action (months): 24-30 months

WORLD BANK financing requested (amount): US$ 200,000.

OBJECTIVES OF THE ACTION

Overall objective(s)

- Revive the Freshwater Fish Farming Sector through the introduction of best practices in tilapia pond operations which provide climate resilience and foster successful business models appropriate to the local Jamaican context.

Specific objective(s)

- Educate and train local community members / students to have aquaculture related skills and experience thereby enhancing livelihoods in the fish farming sector. (fishpond building & maintenance, fish stock management, equipment operation, value-add processing, etc)
- Establish a Modern Fish Farm Demonstration site at Ebony Park for strategic use in developing National Aquaculture Sector
- Update and expand Aquaculture Curriculum to attract youth into the sector with increasing technology applications and profitability.
- Support the development of Freshwater Fish Cooperatives and Clusters to promote small scale fish farming on a Community-wide basis.
- Replicate an appropriate Mother Farm/Satellite Farming sector structure (as proven in Poultry Sector) for Tilapia farming

Target group(s)

- Rural Communities in southern Jamaica – currently in, or interested in, fish farming.
- Students and community participants using the HEART-NSTA training facilities at Ebony Park.

Final beneficiaries

- Existing and Future Freshwater Fish Farmers across Jamaica

Estimated Results

- A Modern Model Tilapia Fish Farm (meeting Climate Resilience concerns as per FAO guidelines) established at Ebony Park developed by enhancing existing fish farm facilities and related premises.
- Updated and Expanded Aquaculture Curriculum and Training Courses established to train students and existing fish farmers in up-to-date skills and knowledge for advancing sector.
- 60 Rural Beneficiaries (existing & new) & 250 students trained in establishing and operating small scale tilapia farming over the 2-year project period.

MAIN ACTIVITIES

HEART-NSTA

- Enhance & modernise the Ebony Park aquaculture physical infrastructure to demonstrate climate resilient tilapia fish farming techniques (as per FAO guidelines).
- Instal & Utilise modern technologies - solar pumps, renewable energy etc. – to control operating expenses.
- Design & develop and upgraded and expanded Curriculum for Modern Aquaculture
- Deliver education & training courses to students & local beneficiaries in modern aquaculture skills at Ebony Park (EP)
- Incorporate the aquaculture sector local knowhow developed into Institutional capacity & capability (curriculum & courses) island-wide, starting with outreach to nearby communities.
- Demonstrate preliminary processing of tilapia harvested and other value-added activities for sale to upmarket consumers.
- Work with NFA to develop the Aquaculture Sector island wide.

JAMAICA FISH FARMERS ASSOCIATION (JFFFA)

- Capacity building of JFFFA to improve its effectiveness with its current & future members.
- Engage in a 2-way knowledge sharing process with HEART-NSTA over the project lifecycle.
- Provide supply chain linkages for the project, integrating current and future needs of the sector with the Institutional training provision by HEART-NSTA.

4-H CLUBS NETWORK

- Provide outreach to the youth and rural communities for the project, working with the other project partners.

DESCRIPTION OF THE ACTION

Background to the Action.

The Jamaican Commercial Aquaculture Sector has seen better days and was at its peak (1990's – 2000's) when several large farms grew tilapia – in mostly southern parishes - for processing and packaging for export (via air freight) to far flung markets such as London in the United Kingdom.

The demise of the Aquaculture Sector was due primarily to major changes in the global marketplace, which made exports from the Jamaican industry uncompetitive, as growing cheaper tilapia exports from Far East suppliers essentially flooded the markets across the world. When the export market from Jamaica failed, the Aquaculture Sector went into decline. Even within Jamaica, local importers were permitted to bring in tilapia food products - which were in frozen, filleted format, more affordable to a greater % of the local population and became consumed on a more regular basis – at the expense of locally produced tilapia.

The sector still suffers from many challenges including the high input costs which increase with creeping devaluation of the Jamaican dollar against the US dollar, affecting the (reliable & predictable) profitability of the fish farming operations. The US$ denominated input costs relate to the price of electricity, transport, fish feed, medications, equipment etc. This devaluation effect was recoverable in the days of exporting the fish (as export sales were in foreign currency) and this undoubtedly helped subsidise the local tilapia market growth and development. Now however this export opportunity no longer pertains, and the successful remaining fish farmers have evolved a business and operational model to control and minimise these foreign cost components, selling only as they are able to the local market.

The Aquaculture Sector currently lacks the sound foundation of a stable, well resourced, "anchor Institution" (such as NCU, CMU, HEART-NSTA, UTECH, UWI etc) with an entrepreneurial, research and development capability and which can serve as the "Custodian" of the Sector's knowhow, assets, research and development, practical operations, Human Resource skills development and provide a "continuity of purpose" on a sustainable, long term basis. Existing Institution aquaculture courses do exist but are not comprehensive enough to adequately service the sectors human resource skills, knowledge, research, and developmental needs of this sector. Such Institutional support and resources would give the Aquaculture Industry, its players and dependents more long-term stability and assurance of success in delivering on the strategic direction and growth of the sector.

Fortunately, there are existing tilapia ponds (2) located at HEART-NSTA (Ebony Park) which are currently under review for refurbishment. There are also other abandoned / underutilised private freshwater ponds in nearby districts and parishes which could serve as a communal resource base for relaunching a modernised tilapia sector.

This action, led by HEART-NSTA and supported by NFA, will utilise Ebony Park to develop a transformational programme with upgraded fishpond facilities to revitalise the Freshwater Fish Farming Sector with support from the Jamaica Freshwater Fish Farm Association (JFFFA) and 4-H Clubs.

Objectives of the Action.

The Aquaculture Sector in Jamaica was once a vibrant industry with successful exports to overseas markets. However, several changes over the years – locally and globally - led to a major contraction in the sector and the cessation of these fish exports. This sub-project aims to revive the Freshwater Fish Farming Sector through a combination of the required actions: the reduction of operating costs, the introduction of best practices in tilapia pond operations, adoption of climate resilience measures, and the development of successful business models appropriate to the local Jamaican context.

Learnings from the remaining Jamaican fish farmers who have "weathered the storm" are instructive in formulating what constitutes an appropriate Business Model & Industry Ecosystem for localised Tilapia farming. The sub-project will aim to demonstrate the required re-engineering of the Aquaculture Sector with:

- Use of modern technologies with cheap renewable power consumption (solar/wind power)
- Processing high quality, fresh, fish products with market differentiation
- Development and use of Fish feed formulation locally (jointly, under separate WB Component 2 Fish Feed Project) to optimally supplement existing, expensive imported-based feeds in feed-conversion ratios.

Key Stakeholder groups, their attitudes towards the Action

HEART-NSTA

This Institution is keen to play a key role in raising the profile of aquaculture in Jamaica to become a larger and more important economic sector offering diverse livelihood opportunities.

Discussions with Dr Janet Dyer, Managing Director, and her team - including Mr Elvis Clarke, Director/Principal at Ebony Park Academy – confirmed the existing status of the ponds at that facility and kindly provided information necessary to detail this Concept Note. They have demonstrated the capability and competence of HEART-NSTA to fulfil the role of Lead Partner on this proposed World Bank sub-project.

NFA

The NFA will use its active programme of providing extension training, technology transfer and supplying seedstock and equipment to fish farmers in Jamaica to support and work jointly with Ebony Park - HEART-NSTA on this project. The Management at the NFA (which was transitioning at time of writing this Concept Note) will detail further in the subsequent Project Proposal development phase.

JFFFFA

Preliminary discussions with Dr Vincent Wright confirmed the potential role which the JFFFA could play in supporting the sub-project by working through its members and the existing supply chain network. There are significant benefits in linking the existing private sector fish farmers with the HEART-NSTA institution at Ebony Park such as ensuring the training courses and curriculum are aligned with the current and future needs – commercial and social - of developing the Jamaican Aquaculture Sector. Equally the knowledge, knowhow and techniques developed at the Institution to address Climate Change resilience and the demonstration of new technologies could help such fish farmers improve their day-to-day operations.

4-H

Talks with Dr Ronald Clarke – Executive Director – confirmed that organisations interest and plans to venture into aquaculture as an important emerging sector for youth livelihoods in Jamaica. They have the organisational capability and performance track record to support HEART-NSTA & the JFFFA with its outreach to the local communities which will be required during the implementation of this sub-project.

Type of Activities proposed, related Outputs and Results.

- HEART-NSTA (Ebony Park) will serve as the location for Modern Aquaculture Fish Farming Model with the:
    - Rehabilitation and upgrading of the existing fishponds on site.
    - Procurement & installation Solar pumps and other renewable energy facilities
    - Demonstration of operational cost saving measures on fish farms.
    - Development of cost-effective supplemental local fish feed formulation
    - Repositioning of fresh tilapia as higher quality / higher priced food
    - Coordinate sales to top end hotels and restaurants (small volumes / higher prices)
    - Implement value-addition & innovations to the farmed fish (market led)
- HEART-NSTA to develop and deliver an updated and expanded Aquaculture Curriculum for teaching and training its students, incorporated within the General Agriculture Programme, including Climate Change and Resilience subject matter.
- HEART-NSTA to support the existing fish farmers and potential fish farmers locally in the advanced techniques of tilapia fish farming to promote climate change resilience and in the setting up of Freshwater Fish Farmer Cooperatives
- NFA to work with HEART-NSTA to act as the coordinator for the sector with support to small farmers across the whole life cycle - supply, grow-out, processing, marketing and sales, value addition.
- JFFFA to work with NFA and HEART-NSTA to redesign Fish Farm Business Model – Reduce Costs, Increase Revenue, optimise feed conversion to costs ratios, experiment with new feed formulations etc.

Broad timeframe for the action and describe any specific factor that has been considered.

The project will be scheduled to be completed in 30 months to allow for the COVID19 pandemic context. However, efforts will be made to complete within 24 months, if changing conditions make that possible.

APPENDIX 1 – PROPOSED BUDGET

PROJECT PARTNER	ITEM DEFINITION	BREAKDOWN (US$)	AMOUNT (US$)
HEART-NSTA	Project Staff Time (Part-time)	50,000	**150,000**
	Faculty Time (Part Time)	20,000	
	Pond items, pipes, fittings etc	10,000	
	Solar Power systems, pumps	20,000	
	Beneficiary Activities Expenses	35,000	
	Operating Costs for Site (2 years)	15,000	
Jamaica Freshwater Fish Farmers Association (JFFFA)	Staff Support to project	10,000	**25,000**
	Capacity build JFFFA	10,000	
	Operational Expenses	5,000	
4-H Clubs	Staff Support	8,000	**25,000**
	Capacity Build 4-H	10,000	
	Operational Expenses	7,000	
	GRAND TOTAL COSTS (over 2 years)		**200,000**

Consultancy to Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture & Alternative Livelihoods

Concept Note for Sub-Project 5

"Livelihoods in Support of Mangrove Ecosystems Conservation"

THE WORLD BANK
IBRD • IDA

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**
(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**
Government of JAMAICA

Vernon "Patrick" Barrett
March 2021

SUMMARY OF THE ACTION

Title of the action:

"Livelihoods in Support of Mangrove Ecosystems Conservation"

Project Partners:

- Alligator Head Foundation (for East Portland Fish Sanctuary & Fish Sanctuary Network)
- University of the West Indies Marine Laboratory (Port Royal & Discovery Bay)
- Living Oceans Foundation (LOF)
- HEART-NSTA

Other Stakeholders (Prospective):

- Fisherfolk Communities – Port Royal & Portland
- National Environment & Planning Agency (NEPA)
- Jamaica Fish Sanctuary Network (FSN)
- Natural History Museum of Jamaica / IOJ (NHMJ)
- Bird Life Jamaica (BLJ)

Location(s) of the action: — specify country(ies), region(s) that will benefit from the action.

- Eastern Jamaica (Portland)
- Kingston Harbour & Port Royal
- Island-wide (via the Fish Sanctuary Network)

Total duration of the action (months): 18-24 months

WORLD BANK financing requested (amount): US$180,000.

OBJECTIVES OF THE ACTION

Overall objective(s)

- Catalyse the paradigm shift to Blue Economy creating appropriate and relevant jobs and relevant livelihoods related to supporting marine ecosystems.

Specific objective(s)

- Educate and train local community members to have practical knowledge of, and working experience with, local Mangrove habitats, thereby enhancing prospects of related livelihoods.
- Define and develop livelihoods incorporating local mangroves, their flora and fauna – Mangrove Tour Guides, Mangrove Wardens, Audio-visual productions, Birding etc.
- Manage, monitor, and maintain mangroves island-wide to safeguard future of fish populations.

Target group(s)

- Coastal Communities near to AHF, UWI (PRML) and participating Fish Sanctuaries (FSN) which have key mangrove ecosystems.
- Other Coastal Communities adjoining the remaining significant Mangrove Forests island wide.
- Tourism actors – resorts, hotels, tour operators

Final beneficiaries

- Fishers and Coastal Communities in Portland, Kingston, Port Royal, and others living near key mangrove ecosystems island wide.

Estimated results

- ***Mangrove Livelihood Training Program (MLTP)*** for preparing beneficiaries (Fisherfolk & Coastal Community members) to act as Mangrove Wardens and Mangrove Tour Guides
- Practical ***Mangrove Monitoring Methodology (MMM)*** standardised for use by Fish Sanctuaries Network using everyday a/v equipment such as cell phones.
- Trained Mangrove Wardens (& Champions) - 18
- Trained Mangrove Tour Guides – 12

MAIN ACTIVITIES

ALLIGATOR HEAD FOUNDATION (AHF)

- Work with HEART-NSTA to identify, define and specify the skills sets and experience needed to perform certain newly defined Mangrove-related livelihoods (Mangrove Wardens, Mangrove Tour Guides etc)
- Adapt elements of existing JAMIN Programme, with LOF assistance, to develop a Mangrove Livelihood Training Programme (MLTP) for Coastal Communities - merging with knowledge about fish nurseries, information about mangrove wildlife – birds, crabs, pollution effects, etc.
- Incorporate additional knowledge about mangrove flora & fauna from NHMJ, NEPA & UWI
- Deliver MLTP, via "Train the Trainers" programme, to targeted Fisherfolk.
- Provide the facilities and staff to engage local community members near mangroves onto awareness/training courses on site (using local schools as venues)
- Work with local tourism operators and resorts to identify income generating jobs and livelihoods related to Mangroves nearby for local community members – with TPDCO, NEPA.
- Disseminate & share techniques for Mangrove Monitoring via the Network (FSN) & HEART-NSTA
- Coordinate with HEART-NSTA a shared, practical island-wide methodology for Mangrove monitoring, management, maintenance, and livelihoods – specifying potential job roles.

LIVING OCEANS FOUNDATION (LOF)

- Provide Support to AHF & HEART-NSTA in the adaptation of existing JAMIN material to suit the new target audience of Coastal and Fishers Communities in content and delivery style.
- Provide guidance and supervision for conducting/assessing the related MLTP Training Sessions.

HEART-NSTA

- Work with practitioners from AHF and the Fish Sanctuaries Network to develop a customised training programme(s) to recognise skills sets relating to marine ecosystems conservation and management (Blue Economy Domain)
- Incorporate the knowledge and processes, developed from this project, into the existing National framework for jobs and livelihoods.
- Provide access to HEART-NSTA facilities island-wide (coastal towns) as required to host events relating to Fish Sanctuary marine ecosystem awareness raising and training.

DESCRIPTION OF THE ACTION

Background to the Action.

Mangrove ecosystems are not protected by law in Jamaica[1] and many such forests are located on private lands in popular resort areas across the island. Consequently, these vital habitats have been cleared over many decades to make way for hotel resorts and other man-made coastal facilities, resulting in substantial damage to the surrounding environment. Amongst other negative impacts, such degradation of mangrove habitats reduces the ability and chances for biphasic fish species to fully recover without their benthic nursery habitats located amongst these forest's root system. This, together with overfishing, may account, in part, for the reported "disappearance" of certain fish types offshore in recent years.

Indeed, Mangroves are a critical component to the overall sustainability of the life and health of the island's marine ecosystems serving as:

- Nurseries for fish and other aquatic life, providing shelter and nutrition,
- Filters for cleaning the seawater,
- Anchors securing the integrity of the adjoining land mass from erosion, and
- Buffers absorbing the impact from hurricane storm surges and the like.

In Jamaica today Mangrove Ecosystems are attracting increasing interest with the primary focus being on the role it plays in Climate Change - acting as it does as a significant store for carbon.

For example, the Inter-American Development Bank (IDB) recently signed an agreement for mangrove restoration with the UWI's Solutions for Developing Countries (SODECO) led by Professor Terrence Forrester. This 'Blue Carbon Restoration in Southern Clarendon' project is designed to restore more than 1,000 hectares of degraded mangrove forests. The US$2.45 million grant was provided by the UK Blue Carbon Fund, which was established in the IDB in 2019.

In addition, the Forestry Department of Jamaica has commenced its assessment of 7,000 hectares of mangrove forests across the island as the Agency moves to develop a plan to manage this resource by 2021. The management of mangroves is new to the Agency which is pursuing this activity with funding being provided to the forest sector by the European Union under its Budget Support Programme. The assessment and plan are also deliverables of the forest sector plan called the National Forest Management and Conservation Plan (NFMCP).

In tandem with these important initiatives, there is a need to raise the awareness of the importance of mangrove habitats, particularly to those who live nearby and those who depend on a healthy marine ecosystem for their livelihoods – fisherfolk, coastal and tourist operators, hoteliers, and the wider Tourism Industry. ***There is also a need to "monetise" such ecosystems in ways that do not require its destruction or removal***, such that these local communities benefit financially – preferably directly. (It is said that there is the continuing practice of using mangrove wood for making charcoal and the wood also has other applications in fishing practices). The obvious analogy is the Game Parks of Africa where tourists who once came to shoot "wild game" now come to shoot photographs and videos of these same animals.

This project seeks to identify and develop the untapped potential for mangroves to facilitate alternative livelihoods via ecotourism activities – Mangrove Tour Guides; Mangrove Wardens; Birding; Photography; Video Productions – for those who reside in Communities closest to them. It will do so by working with entities, who have been training and educating Jamaican school children about the importance and value of these ecosystems (JAMIN Program), to develop suitable Training Programmes for targeted beneficiaries – transitioning them into the Blue Economy with appropriate skills sets.

[1] Assessment Report - Assessment of the potential for Mariculture Development in Jamaica - Reference No.: JM-MICAF-138252-CS-CQ (18 August 2020) AquaBioTech Group – page 47

Objectives of the Action

The project seeks to develop and introduce a customised awareness raising, education and training programme (MLTP) to the Fishers and Coastal Communities of Jamaica – specifically those who live near to Mangrove Forests. This **Mangrove Livelihood Training Programme (MLTP)** will form the basis for diversified livelihoods for this target beneficiary group.

For several years now there has been a Mangrove Educational Program (JAMIN) delivered by Living Oceans Foundation (LOF) in Trelawny (2014 onwards) and recently Portland (since 2019) at local secondary schools such as William Knibb and Titchfield.

Now, the Alligator Head Foundation (AHF) seeking to continue work with LOF in adapting such content – in an appropriate format and in conjunction with other appropriate information and skills sets – to produce a Mangrove Livelihood Training Programme (MLTP). This will be used to educate and prepare Fishers and others across the Fish Sanctuary Network (FSN) for livelihoods based around mangroves.

The additional information and skills will relate to activity that can be conducted in roles within the tourism sector to earn such beneficiaries a livelihood, even on a part-time basis. This livelihood interdependence will provide further incentive and a vested interest in neighbouring communities protecting the existence and vibrance of the mangrove habitats.

Maximum impact and benefit will accrue from such project activity when relevant Institutions – such as HEART-NSTA – are engaged to provide continuity and credibility for the programme developed in its educational and skill set acquisition function.

In summary the objectives of the project are to:

- Secure Mangrove Ecosystems in their function as fish nurseries etc
- Generate related mangrove livelihoods for neighbouring fishers & their communities.
- Train and raise awareness by local fishers and communities about the roles of mangrove habitats.
- Progress the existing school education programs (JAMIN) to lead to practical livelihood opportunities around mangroves & marine ecosystems via MLTP
- Develop new Mangrove Livelihood Training Programs (MLTP) and deliver them to produce:
    - Mangrove Tour Guides (12)
    - Mangrove Warden (18)

Key Stakeholder groups, their attitudes towards the action.

<u>Alligator Head Foundation (AHF)</u>

The AHF has been consulted and are confident that they can build on the experiences thus far with the JAMIN program and AHF relationships with the existing Fishers Communities targeted for this intervention. They also agree with the need to disseminate the Mangrove Livelihood Training Programme developed with the other Fishers Communities island-wide via the Fish Sanctuary Network (FSN)

<u>Living Oceans Foundation (LOF)</u>

The LOF have been consulted and discussions had regarding their role in the development and delivery of this pilot intervention. They have agreed to support AHF in its implementation such that AHF is capacity-built in its role and able to extend its current capability to serve the Blue Economy Sector in Jamaica for the future.

Briefly state the type of activities proposed and specify related outputs and results.

- AHF & HEART-NSTA work together to identify, define, and specify the skills sets and experience needed to perform certain newly defined Mangrove-related livelihoods (Mangrove Wardens, Mangrove Tour Guides etc)
- AHF adapt elements of the existing JAMIN Programme, with LOF, to develop an Awareness and Educational Programme for Coastal Communities - merging with UWI knowledge about fish nurseries, information about mangrove wildlife - birds and crabs, pollution effects, etc.
- AHF incorporates additional knowledge about mangrove flora & fauna from NHMJ/IOJ, NEPA & UWI into the modified JAMIN programme to result in a customised Mangrove Livelihood Training Programme (MLTP) to give recognition to skills sets relating to marine ecosystems conservation and management (Blue Economy Domain)
- AHF delivers the MLTP curriculum, via JAMIN "Train the Trainers" programme, to targeted Fisherfolk.
- Training MLTP workshops conducted (over 2/3-day periods) with targeted beneficiaries by AHF Trainers.
- AHF Work with local tourism operators and resorts to identify income generating jobs and livelihoods related to Mangroves nearby for local community members – with TPDCO, NEPA.
- AHF disseminates shared MLTP learning and techniques to others via the Network (FSN) with support from HEART-NSTA facilities island-wide.
- Design a shared island-wide Methodology for Mangrove Monitoring, management, maintenance, and livelihoods – specifying potential job roles & tasks.
- HEART-NSTA incorporates the knowledge and processes, developed from this project, into the existing National framework for jobs and livelihoods.

The outputs and outcomes from this project will include:

- A hands-on **Mangrove Livelihood Training Programme (MLTP**) with curriculum and content
- 3 sets of MLTP Workshops delivered to a total of 30 beneficiaries over a 12-month period.
- 18 trained Mangrove Wardens (across the island via FSN)
- 12 Mangrove Tour Guides (Kingston Metropolitan area and Trelawny/St James area)
- Engagement with HEART-NSTA for skills recognition and integration into national framework
- A standardised, practical **Mangrove Monitoring Methodology (MMM)** shared across the FSN

State the broad timeframe for the action and describe any specific factor that has been considered.

The project will be scheduled to be completed in 24 months to allow for the COVID19 pandemic context. However, efforts will be made to complete within 18 months, if changing conditions make that possible.

APPENDIX I – BUDGET ALLOCATION

PROJECT PARTNER	ITEM DEFINITION	BREAKDOWN (US$)	AMOUNT (US$)
Alligator Head Foundation	Staff Time	60,000	**105,000**
	Trainers	10,000	
	Trainees workshops – Communities	20,000	
	Overheads & Capital Items	15,000	
HEART-NSTA	Staff Support	10,000	**20,000**
	Operational Expenses	10,000	
Living Oceans Foundation	Adaptation of Programme	15,000	**35,000**
	Implementation Support	10,000	
	Travel Expenses (3 trips)	5,000	
	Video Production	5,000	
UWI (Marine Labs)	Staff Time	10,000	**20,000**
	Overheads and Capital Costs	10,000	
	GRAND TOTAL COSTS (over 2 years)		**180,000**

Consultancy to Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture & Alternative Livelihoods

Concept Note for Sub-Project 6

"Community Based Freshwater Fish Farming"

THE WORLD BANK
IBRD • IDA

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**
(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**
Government of JAMAICA

Vernon "Patrick" Barrett
March 2021

SUMMARY OF THE ACTION

Title of the action:

"COMMUNITY BASED FRESHWATER FISH FARMING"

Project Partners:

- College of Agriculture, Science and Education (CASE) – Lead Partner
- 4-H Clubs
- National Fisheries Authority (NFA)

Other Stakeholders (Prospective):

- Community Based Organisations / NGO's

Location(s) of the action: — specify region(s) that will benefit from the action.

- Eastern Jamaica (Portland, St Thomas, St Mary)

Total duration of the action (months): 24-30 months

WORLD BANK financing requested (amount): US$180,000.

OBJECTIVES OF THE ACTION

Overall objective(s)

- Build CASE capacity to lead development of Community-based, Freshwater Fish Farming Sector by expanding and using existing infrastructure – assets, faculty, students, networks.
- Demonstrate pathways for enhancing Climate Change Resilience in food production for the wider country via aquaculture.

Specific objective(s)

- Engage local community members in alternative livelihoods to operate integrated aquaculture-agriculture production model farms.
- Grow out, manage, harvest and process fish (Basa and/or Tilapia) on domestic scale in rural areas.
- Educate and train the younger generation with skills and expertise to pursue careers/livelihoods in aquaculture.
- Increase the level of technology, knowhow, and marketing in freshwater fish farming sector to future-proof against Climate Change, enhancing national food security.
- Sensitise the target groups to Climate Change & Food Security issues

Target group(s)

- CASE faculty, students, surrounding communities.
- Communities in Portland; St Mary; St Thomas

Final beneficiaries

- Freshwater Fish Farming Sector
- Rural communities in Eastern Jamaica
- Existing smallholder farmers

Estimated Results

- CASE successfully operating a freshwater fish hatchery with full cycle grow-out demonstration fish farm producing and processing Basa (and/or Tilapia)
- CASE supplying local fish farmers with said fish (specify volumes and growth life stages - kg per annum) for them to grow out on their rural home properties.
- A functioning training and support program on integrated aquaculture-agriculture for local small farmers (60 participants over 3 years)
- Viable demonstration model of integrated aquaculture-agriculture at CASE with associated livelihoods
- 3 "Demonstration" Aquaponics Systems installed in local Communities enabling alternative livelihoods.

MAIN ACTIVITIES

COLLEGE OF AGRICULTURE, SCIENCE & EDUCATION

- Work with NFA to conduct Basa fish breeding/propagation to supply local fish farmers with said fish for them to grow out from fry/fingerling stages.
- Expand and enhance existing CASE fish/aquaponics facilities with additional ponds & equipment.
- Acquire and install Solar power sources for affordable operational costs.
- Support freshwater fish production / grow out by targeted rural farmers in neighbouring parishes using faculty and student base.
- Demonstrate integrating fish rearing into small farming practices with Climate Resilience measures (e.g., rainwater reservoirs, aquaponics models, solar power)
- Develop relevant freshwater fish farming curriculum and teach students with hands-on demo facilities.
- Design & Implement a functioning training and support program on integrated aquaculture-agriculture for local small farmers (60 participants over 3 years)
- Develop a sustainable demonstration business model for integrated aquaculture-agriculture.
- Build and install 3 Demonstration Aquaponics Systems in nearby local Communities.

NATIONAL FISHERIES AUTHORITY

- Supply Hatchery at CASE[1] with brood stock supplies (Basa and Tilapia)
- Support the propagation and management of Basa and/or Tilapia at CASE (volumes & life stages)
- Disseminate the learning, knowhow & expertise developed at CASE's across the island to relevant stakeholders.
- Document the project and its progress for future generations providing "continuity of purpose" and longer-term sustainability.

[1] CASE (Dr Deslandes) indicated that he was having discussions with NFA about this at time of writing this document.

DESCRIPTION OF THE ACTION

Background to the Action.

The Jamaican Aquaculture Sector, at its peak during the 1990's – 2000's, operated with traditional Commercial private sector farming entities, having aspects of the "Mother" or "Nuclear" Sector Model. Several large/medium sized farms grew Tilapia – mostly in southern parishes - for processing and packaging for export (air freight) to far flung markets such as London in the United Kingdom via the coordination of a larger player (Jamaica Broilers). To the author's knowledge, from extensive research, there has been no "Community-based" Aquaculture Models – such as exists in Asia, Africa and, closer to home, in Haiti - operational in Jamaica, to date.

The demise of the Jamaican Commercial Aquaculture Sector was due primarily to major changes in the global marketplace, which made exports from the Jamaican industry uncompetitive, as growing cheaper Tilapia exports from Far East suppliers essentially flooded the markets across the world. When the export market from Jamaica failed, the Aquaculture Sector went into decline. Even within Jamaica, local importers were permitted to bring in Tilapia food products - which were in frozen, filleted format, more affordable to a greater % of the local population, and which became consumed on a more regular basis – at the expense of locally produced Tilapia.

The freshwater fish farming sector still suffers from many challenges including the high input costs which increase with creeping devaluation of the Jamaican dollar against the US dollar, affecting the (reliable & predictable) profitability of the fish farming operations. The US$ denominated input costs relate to the price of electricity, transport, fish feed, medications, equipment etc. This devaluation effect was recoverable in the days of exporting the fish (as export sales were in foreign currency) and this undoubtedly helped subsidise the local Tilapia market growth and development. Now however this export opportunity no longer pertains, and the successful remaining growers have evolved a business and operational model to control and minimise these foreign cost components, selling only as they are able to the local market.

The importance of fish farming as a source of affordable, more "climate friendly" protein for human consumption has been well documented by the Food and Agriculture Organisation (FAO) of the UN. Globally the fish farming sector has shown incredible growth rates and is playing a key role in ensuring food security for many countries. Following on from Tilapia farming pioneering in the mid 1900's, there has been the successful "domestication" of other species of fish - such as Basa (pangasius) – which are being bred and propagated in tropical developing countries using models which are Community-based. Such community oriented operational models include Aquaponics, Agroecology, and Integrated Agriculture-Aquaculture.

Historically, the Aquaculture Sector in Jamaica lacked the sound foundation of a stable, well resourced, "anchor Institution" (such as NCU, CMU, HEART-NTA, UTECH, UWI etc) with an entrepreneurial, research and development capability and which can serve as the "Custodian" of the Sector's knowhow, assets, research and development, practical operations, Human Resource skills development and provide a "continuity of purpose" on a sustainable, long term basis. Existing Institution aquaculture courses do exist but are not comprehensive enough to adequately service the sectors human resource skills, knowledge, research, and developmental needs of this sector. Such Institutional support and resources would give the Aquaculture Industry, its players and dependents more long-term stability and assurance of success in delivering on the strategic direction and growth of the sector.

Fortunately, at this moment in time, the College of Agriculture, Science and Education (CASE) located in Portland has been developing institutional capability and competence in Aquaponics and has recently started with small scale ponds and developing student courses linked to this subject matter.

This action, led by CASE, will build on the current initiative, and develop a transformational programme with upgraded fishpond facilities to launch a Community-based Freshwater Fish Farming Sector, for neighbouring, local, rural communities, supported by the National Fisheries Authority and 4-H Clubs (tapping into their local youth networks).

Objectives of the Action

Jamaica needs to improve its food security and increase its supply of healthy protein for consumption by its population and tourist visitors in a cost-effective, affordable, environmentally friendly and climate resilient manner. Freshwater fish farming provides such an option, providing the economics of the sector model are sustainable in the long run.

This sub-project no. 6 – "Community Based Freshwater Fish Farming – supplements sub-project no. 4 entitled "Revitalising Freshwater Fish Farming" which is led by HEART, and based in central Jamaica, and focussed on Tilapia. Together they will help Jamaica expand its freshwater fish sector and markets and provide additional livelihoods for the target beneficiary groups of this World Bank Programme.

The specific objectives of this sub-project are:

- Engage local community members in Eastern Jamaica in alternative livelihoods to operate Integrated Aquaculture-Agriculture Model home farms.
- Grow out, manage, harvest and process fish (Basa and/or Tilapia) on domestic scale in rural areas amongst existing communities.
- Educate and train the younger generation with skills and expertise to pursue careers/livelihoods in Aquaculture.
- Increase the level of technology, knowhow, and marketing in freshwater fish farming sector to future-proof against Climate Change, enhancing national food security.
- Sensitise the target groups to Climate Change & Food Security issues

Key stakeholder groups, their attitudes towards the Action.

<u>CASE</u>

Discussions were held with Dr Derrick Deslandes and his team at CASE including Dr Garth Scott to identify their status in this area and the related plans for their Institution. They had been in contact with the NFA regarding supplies of Basa fish and were enthusiastic in their support for this initiative and its potential linkages to CASE's Aquaponics programme. They were aware, as was the author, of previous efforts by ALGIX to introduce Basa into Jamaica and had taken on board the learnings from that recent endeavour, in their planning process.

<u>NFA</u>

CASE confirmed it had been in contact with the NFA re the supply of Basa to the institution for fry and fingerling production (see footnote in section above). The role and working arrangement will be detailed at the next stage of project proposal formulation.

4-H CLUBS

Talks with Dr Ronald Clarke – Executive Director – confirmed that organisations interest and plans to venture into aquaculture as an important emerging sector for youth livelihoods in Jamaica. They have the organisational capability and performance track record to support CASE in its outreach with the local communities required during the implementation of this sub-project.

Type of Activities proposed, Related Outputs and Results

The sub-project includes a combination of aquaculture and aquaponics infrastructure expansion and organisational development at CASE's - the Lead Partners - existing facilities. This capacity building will enable it to work effectively with its project partner - NFA - to launch the propagation, on its premises, of Basa (and/or Tilapia) fry and fingerling for supply to the rural communities nearby. These target Communities will be supported by CASE in the fish grow out phases and route-to-market processes, thereby engendering their livelihood prospects. A total of 60 such beneficiaries will be supported over the project lifespan of 24-30 months (maximum). The approach will utilise the successful Community-based Fish Farming Model in Haiti implemented by the Food for the Poor organisation, the ISA experiences in the Dominican Republic, and reference the well-developed and proven Far East integrated agriculture-aquaculture sectoral practices in this area.

CASE will develop a related aquaculture and aquaponics curriculum and course material for the practical training of its students enrolled, preparing the next generation of youth for livelihoods based on the aquaculture sector. The students will receive training in related areas of aquaculture and be involved in the outreach support programme to the targeted fish farmer beneficiaries. It is expected that the student intake on these courses, over the 2-year period, will number 60 individuals, with a good representation of women candidates.

CASE will build 2-3 demonstration Aquaponics facilities in neighbouring Communities as part of their in-field training and support for livelihood developments for target beneficiaries.

Broad timeframe for the action and describe any specific factor that has been considered.

The project will be scheduled to be completed in 24-30 months to allow for the COVID19 pandemic context. However, efforts will be made to complete within 24 months, if changing conditions make that possible.

APPENDIX 1 – PROPOSED BUDGET

PROJECT PARTNER	ITEM DEFINITION	BREAKDOWN (US$)	AMOUNT (US$)
College of Agriculture, Science & Education (CASE)	Project Staff Time (Part-time)	40,000	**150,000**
	Faculty (Part Time)	15,000	
	Build Community Aquaponics Systems (2/3)	20,000	
	Pond Expansion, pipes, fittings etc	40,000	
	Solar Power systems, pumps	20,000	
	Beneficiary Activities Expenses	15,000	
National Fisheries Authority	Staff Support	10,000	**15,000**
(NFA)	Operational Expenses	5,000	
4-H Clubs	Staff Support	8,000	**15,000**
	Operational Expenses	7,000	
	GRAND TOTAL COSTS (over 3 years)		**180,000**

Consultancy to Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture & Alternative Livelihoods

Development of Concepts for Sub-Projects

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**
(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**
Government of JAMAICA

Vernon "Patrick" Barrett
November 2020

SUMMARY

This report covers the third Phase of the Assignment which led to the development of Concepts for sub-projects through a series of iterative discussions – Via Zoom & What's App - with targeted Stakeholders.

A key part of the process was to envision the likely scenarios in the coming months and years, given the current context of COVID19, the Government of Jamaica's stated priorities, the capabilities and limitations of the Stakeholders involved and where possible build on current successes in the related fields.

A final, complete list of the Interviews and discussions with the targeted stakeholders which had been identified is listed in Appendix II. These interviews were instrumental in providing an up-to-date picture of the state of the different sectors and details of the many issues facing the target groups and communities.

In total, six (6) such Concepts for sub-Projects were confirmed on which to base the allocation of World Bank funding available. These are detailed in the attached PowerPoint Presentation – Validation of Sub-Project Concepts.

These Sub-Project Concepts were presented, discussed, and validated at the Stakeholder & Validation Workshop held at the Jamaica Pegasus Hotel, and broadcasted simultaneously online via Zoom, on 14 January 2021.

The total estimated Budget value for the 6 projects is currently US$1.37 Million and is subject to change, depending on the financial and cost information being provided in the coming weeks by each of the Partners designated to implement these actions.

Detailed Concept Notes are currently being written by the Consultant for each of these Sub-Projects, with contributions and support from the respective Project Partners. Final drafts of these Concept Notes are scheduled for completion in early March 2021.

RATIONALE

There were numerous needs identified across the portfolio of actors in the Aquaculture and Mariculture domains in Jamaica, naturally far more that current World Bank funding could support. A prioritisation process was therefore used to determine the areas where greatest impact could be made and which were likely to yield successful outcomes, in the current circumstances.

Fish Sanctuaries - Securing the Marine Environment

Central to any strategy for sustainable development must be the preservation and conservation of healthy ecosystems and this is as true for marine environments as it is for land habitats.

The Fish Sanctuaries and Marine Protect Areas are central to achieving these objectives and there has been reasonable demonstrable success since the first of these was designated in Jamaica some 10+ years ago.

However, with the advent of COVID19 some of these Sanctuaries have experienced increased pressures from illegal human incursions and some income limitations.

These Fish Sanctuaries have a track record of working with members of neighbouring Fisher Communities and some have experience with implementing and managing funded projects

The core principle is to protect the substantive work accomplished by the FS which, having taken years to yield positive results, can be decimated in a matter of months or weeks.

Sub-Projects 1, 3, and 5 will support Fish Sanctuaries in securing the Marine Environment and provide a sound base for the further development of the Blue Economy.

Sea Moss - Farming the Seas

Another principle is to give nature a helping hand with for example starting farming of native marine life species – plants and animal.

Continually taking from the sea without replenishment is highly unsustainable and will lead to stock collapses which COULD be irrecoverable. Attempts to monitor and regulate harvesting and fishing need strengthening but also assisting the natural reproductive rates is needed. So, fishers should expand their role from being “reapers” to also being “sowers” – as land -based farmers operate. In this regard, the farming of fish is recommended and that will take significant resources, training, and investment (this is being pursued apparently as another project, forming part of this same WB programme).

A much quicker win is the farming of marine plant life – seaweed / sea moss – and its processing to drinks, spa products and other value-added items. Sea Moss is well known locally but has been, to date, harvested from the wild and not grown commercially.

Sub-Project 1 will engage local Fisherfolk Communities in the development of Sea Moss Sector, led though pilots conducted by Fish Sanctuaries.

Aquaculture - Fish Farming On land

Fresh water fish farming has been revolutionising the provision of healthy, affordable protein for growing human populations globally, particularly in developing countries.

Jamaica already has significant existing aquaculture infrastructure – including some underutilised ponds – which remains after a more successful period for the sector some 20+ years ago. What is required is new operational and sector models to revive the industry's fortunes, addressing the issues identified earlier in the Situational Analysis of this assignment. Examples of Community based fish farming worldwide provide models for re-imagining and rejuvenating the stagnant Aquaculture sector in Jamaica.

Fortunately, this assignment's timing occurs when a couple of well-established Jamaican educational and training Institutions – HEART-NTA and CASE – were investigating in developing the Aquaculture Sector. Institutional support for the Aquaculture Sector has historically been a shortcoming hindering the progress and evolution of the local industry.

Sub-projects 4 & 6 will support Community-based Climate Resilience through Aquaculture initiatives engaging both these Institutions in separate, yet complimentary, actions.

Greening the Blue Economy

Jamaica, like many Small Island Developing States (SIDS) suffers from a high cost of energy, almost all of which is import-based. Even the recent advances in renewable energy locally, with construction of Wind Power and Solar Power farms, have not significantly benefitted the end consumer pricewise due to National Grid issues and policies.

Harnessing the country's Blue Economy will require affordable and globally competitive energy sources. The imperative to address the Global Climate Emergency through the renewed Green Agenda (COP 26 Glasgow) provides a conducive environment to assist local Fish Sanctuaries and Fisher Communities transition to clean energy sources.

The direct access to Solar Power and use of electric boat engines will have the dual impact of reducing pollution in the marine environment and ensuring less disturbance to, and pressures on the marine life.

Sub-Project 2 will pilot the transformation of Fish Sanctuaries to operate more cost-effectively, become more sustainable and resilient.

APPENDIX I -

POWERPOINT PRESENTATION – Validation of Sub-Project Concepts (see separate document)

APPENDIX II

INTERVIEWS WITH TARGETED STAKEHOLDERS - NFA SUB-PROJECT IDENTIFICATION (World Bank)

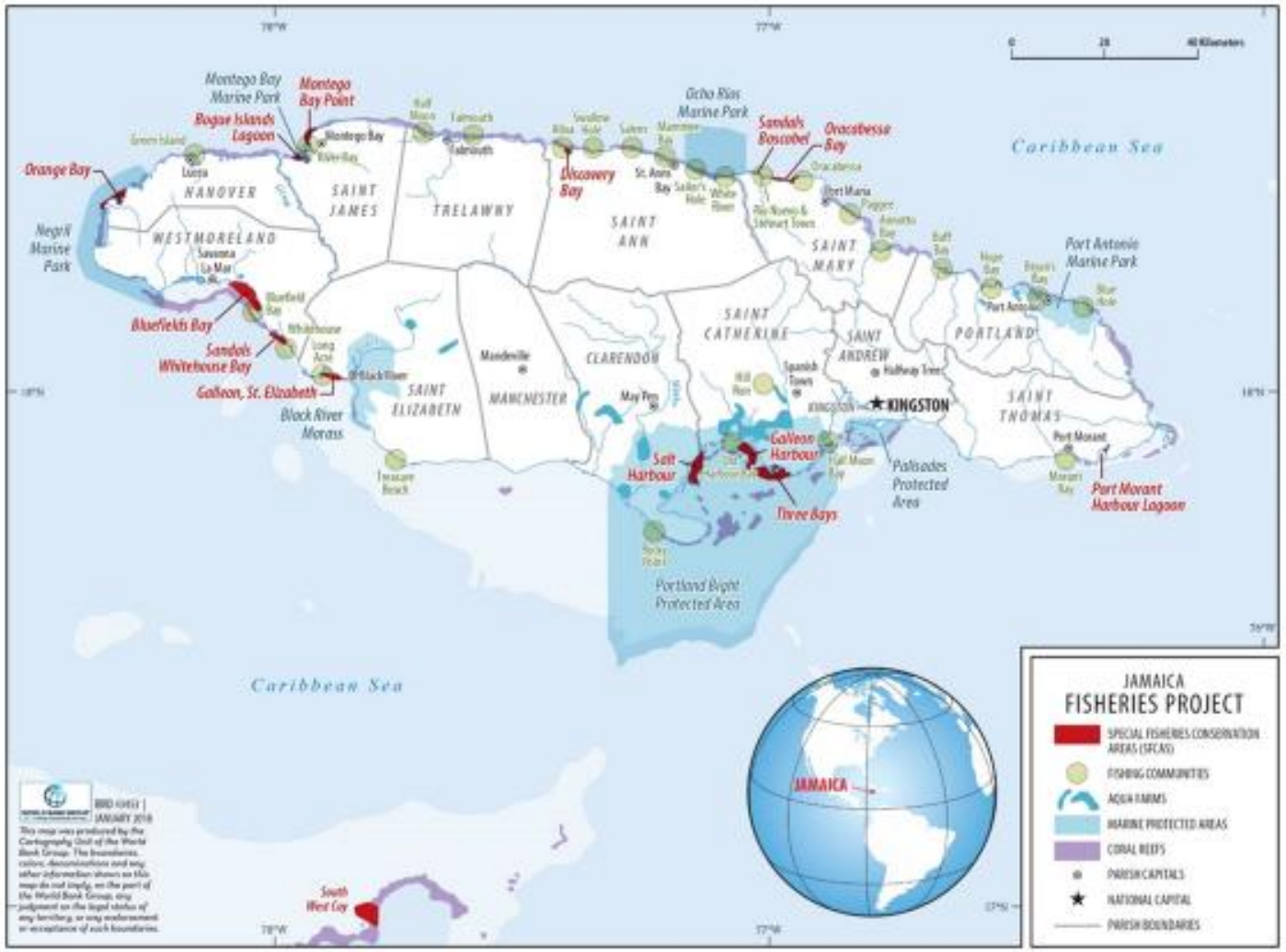
Final List - 14 January 2021

ID. NO.	ORGANISATION NAME	CONTACT PERSON	TITLE	STATUS	COMMENTS
Associations, Cooperatives and Fish Sanctuaries					
1	BREDS-Galleon Sanctuary	Luke-Ben Brown	Sanctuary Manager	Completed (13/10)	Spoke ith Ms Luke-Ben Brown - discussions ongoing Sub-Project 3
2	Alligator Head Foundation	Nickie Myers	Sanctuary Manager	Completed (21/10) & (8/12)	Spoke with Mr Machel Donegan - discussions ongoing Sub-project 5
3	Oracabessa Bay Fish Sanctuary	Inilek Wilmott	Sanctuary Manager	Completed (13/10 & 14/12)	Spoke with Mr Inilek Wilmott - discussions ongoing Sub-project 1
4	Gillings Gully Fishermen Co-operative	Denise Blackwood	Manager	Completed (27/10)	Spoke with Denise Blackwood
5	Green Island Fishermen Group	Mr Bowen	President	Completed (26/10) & (17/12)	Spoke with Mr Bowen
5a	Orange Bay Fish Sanctuary	Ms K Spencer	Manager	Completed (18/12)	Spoke with Ms Spencer
6	Jamaica Fisherman's Co-operative Union	Ms Ionie Henry	General Manager	Completed (15 & 20 /10)	Included Glaston White & Ionie Henry
7	Jamaica Freshwater Fish Farmers' Association	Dr Vincent Wright	President	Completed (23/10	Spoke to Dr Wright
8	Jamaica Ornamental Fish Farmers' Association	Mr Norman Dawson	President	Completed (27/10)	Spoke with Mr Dawson
8a	Ornamental Fish Sector Representatives	Mr Chris Higgins		Completed (13 & 20/10)	Included Chris Higgins & Devearn Breakenridge & Ms Gray
Government Ministries & Agencies					
11	Minister of Agriculture & Fisheries	Mr Floyd Green	Minister	Ongoing	Listened to ZOOM webinar -Trelawny Fisherfolk (24 Oct)
12	Minister of Tourism	Mr Edmund Bartlett	Minister		Advise Minister as Blue Economy Linkages develop
14	Tourism Product Development Company	Mrs A Chung	Director		Engage as projects develop if necessary
15	HEART-NTA	Dr Janet Dyer	Senior Director	Completed (18/12)	Spoke to Dr Janet Dyer - discussions ongoing Sub-project 4
17	NEPA	Mr Peter Knight	CEO	Completed (9/12)	Spoke to Monique Curtis
17a	Forestry Department	Ms Oliphant	Acting CEO	Completed (11/11)	Spoke to Ms Oliphant
17b	JBDC	Ms Valerie Viera	CEO	Completed (4/11)	Spoke to Ms Veira & Mr Davis
17c	CASE	Dr Derrick Deslandes	President	Completed (15/12)	Spoke to Derrick Deslandes, Garth Scott - discussions ongoing Sub-project 6
17d	CMU	Joachim Schmillen	Executive Director	Completed (2/11)	Spoke to Mr Schmillen - discussions ongoing Sub-project 2
Financial Institutions					
20	Tourism Enhancement Fund	Dr Carey Wallace	Executive Director	Completed (12/10)	Awaiting info from Johan Rampair
Private Sector					
21	PSOJ	Mr Keith Duncan	President	TBD	Advise and engage as and when required
23	Branson Centre for Entrepreneurship (Caribbean)	Ms Lauri-Ann Ainsworth	CEO	Completed (22/10) & (16/11)	Spoke to Ms Williams in follow up session in Nov.
Global Institutions					
24	World Bank	Ms Maja Murisic	Team Task Leader (Washington)	Completed (14/10)	Awaiting info to be emailed from WB
25	FAO / CC4FISH	Dr Crispim Moreira	Country Representative	Completed (14/12)	Spoke to Ms. I Monnereau & Ms Allen
26	European Union	Stefano Cilli (or successor)	EU Officer responsible for Fisheries/Environment	Completed (14/10)	Spoke to Mr Cilli
Ongoing Marine Climate Change Projects					
27	SODECO (UWI-Mona)	Prof. Terrence Forrester	Managing Director	Initial Contact made	May have constraints from project terms
29	The Nature Conservancy	Donna Blake	Director	Completed (15/10) & (17/11)	Spoke to Ms Blake & Ana Cherice
Other Global Organisations					
30	Living Oceans Foundation	Ms Amy Heemsoth	Director of Education	Completed (10/12)	Spoke with Ms Heemsoth

Quick Overview of Sub-Projects

ID	NAME OF SUB-PROJECT	PARTNERS INVOLVED	BUDGET SIZE (est.)	MAIN LOCALES (initially)	KEY BENEFICIARIES
1	Farming Seaweed / Processing Sea Moss	Oracabessa Bay Foundation, Fisher Communities (Portland, St Mary), CASE, FAO, AHF?	US$280k	Northern & Eastern Jamaica	Fish Sanctuaries, Fisherfolk (income Generation/Livelihood
2	Renewable Energy in Marine Applications	CMU, Jamaica Fisherman's Cooperative Union, Fish Sanctuary Network (FSN)	US$250k	South Coast & Western Jamaica	Fish Sanctuaries (cost savings) Small Fishers New Livelihoods
3	Sustaining Fish Sanctuaries & local Fishers	Galleon/BREDS, Fishers (South Coast), NFA, JDF/Coast Guard?	US$250k	South Coast & Western Jamaica	FS-Income Generation Securing ecosystems
4	Revitalise Freshwater Fish Farming (Tilapia)	HEART-NTA (Ebony Park), JFFFA, 4-H Clubs?, FAO?	US$230k	Inland Jamaica (Central/South)	Freshwater Fish Farme Rural Communities
5	Livelihoods in Mangrove Conservation	Alligator Head Foundation, HEART-NTA, FSN, LOF?	US$180k	Island-wide	Fisher Communities alternative livelihoods
6	Pilot Community based Fish Farming (Basa)	CASE, Communities (Portland, St Mary, St Thomas), NGO's?	US$180k	Eastern Jamaica	Rural Communities food security / income savings

APPENDIX IV – MAP OF JAMAICA's KEY FISH SANCTUARIES



Consultancy to Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture/Polyculture & Alternative Livelihoods

A SITUATIONAL ANALYSIS

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**

(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**

Government of JAMAICA

Vernon "Patrick" Barrett

November 2020

Table of Contents

1. Introduction

This is the second report for the consultancy assignment to "Identify Sub-Projects on Climate Resilient Freshwater Aquaculture, Coastal Mariculture / Polyculture and Alternative Livelihoods". It has been compiled after a process of document acquisition and reading, internet research & webinars, discussions with colleagues and contemporaries, and virtual interviews and consultations with jointly identified stakeholders, covering the period October 5 to November 6, 2020.

Process of Situational Analysis

Appendix 1 carries the Literature Review list of documents and prior projects' documentation which was provided/acquired/accessed and studied. Many of the written reports from previous studies were dated from more than 5-8 years ago and so it was important and useful to supplement this secondary information with online information sources, including the newly appointed Minister Floyd Green's insightful Listening Roadshows with Fisherfolk. Additionally, primary research - conducted through interviews with stakeholder contacts, jointly identified with NFA personnel - was helpful to get a current perspective, albeit subjective in parts.

The list of people interviewed remotely (via ZOOM or What's App) during the period is shown in Appendix 3. There are still, hopefully, a few more interviews to be conducted in the coming weeks of November 2020, to conclude this process of completing this Situational Analysis as comprehensively as possible in the given timeframe, pending COVID19 Pandemic constraints. These consultations are subject to confirmation depending on interviewee availability[1]. However, most of the important interviews have now been completed to provide an adequate contextual setting for the next Project Phase of Visioning and Conceptualising a range of sub-projects at a high level with relevant stakeholders. This overlapping Phase has commenced, as seen in the narrative of the respective sections entitled "Sub-Project Concept Ideas".

For the purposes of this Situational Analysis, the Stakeholders interviewed were grouped according to their type of category, as follows:

- Associations, Cooperatives and Fish Sanctuaries
- Social Development Agencies
- Government Ministries and Agencies
- Financial Institutions
- Private Sector
- Global Institutions
- Ongoing Related Projects

The relevant Socio-economic Sectors which relate to this consultancy assignment were shortlisted as:

- Freshwater Aquaculture (Rural) – Tilapia Fish Farming
- Freshwater Aquaculture (Urban) – Ornamental Fish Farming
- Near & Far Shore Fisheries – Jamaican Fisheries
- Fish Sanctuaries and Marine Protected Areas – Blue Economy Domain
- Mariculture – Emerging Marine Farming (Sea Moss, Sea Cucumber, Captive Fish etc.)

[1] This document is to be considered a "work in progress" and will be updated, as and when necessary, if major findings are revealed in next phase.

Summary of Findings

From this Situational Analysis exercise, it became clear that some of the above listed Sectors – such as Tilapia Farming and Ornamental Fish Farming - had seen much better days and were in a state requiring reimagining and reinvention. There were fundamental challenges common to these Sectors – cost of energy, small/non-existent export markets, praedial larceny (sophisticated and large scale), limited application of modern technologies, individual "solo" operators, inadequate institutional support, etc. – which required major transformations of the status quo, due to inappropriate Business Models, poor Sector Infrastructure and inadequate Commercial Ecosystems.

The Fisheries – near shore and far shore – were still suffering from the effects of overfishing and damaged ecosystems and in need of modernisation and significant transformation, with the interests of the fisherfolk central to any new model proposed. At the time of writing, restrictions were still in force on Queen Conch fishing on the Pedro Cays.

The other remaining Sectors of Mariculture and Fish Sanctuaries were nascent and small scale, having mixed fortunes in recent years, but with signs of good promise for further development. This is being researched through a simultaneous ongoing assignment, funded through the same World Bank Programme.

The findings of this Situational Analysis set the scene for answering the questions: what type of Sub-projects would be most appropriate; what realistic objectives these sub-projects should have; which entities are best placed to implement them; project size, scale and duration; what project outputs and outcomes can be expected, etc.

Next Steps

The next Phase of this assignment will be to convene group discussions where possible (via Zoom) to explore the longlist of high-level concepts contained in this document with the relevant stakeholder parties. This process should also include obtaining feedback from the Project Steering Committee, either on a one-to-one basis or as a collective.

The objective of that Visioning Phase will be to arrive at a shortlist of potential sub-projects – say 5 or 6 in number - which can then be fleshed out in more details as Concept Notes.

COVID19 Context

The study assignment to which this report refers was conducted at the time of the COVID19 Pandemic of 2020, which is of uncertain duration (as of November 2020) and is disrupting the economies of many countries globally, including Jamaica. In particular, the country's tourist sector has been operating at very low levels since March 2020 and many local people from all walks of life have seen their personal income decline or cease altogether. This is having severe effects on the livelihoods of people who depend on these tourism related sectors, who, for example would be supplying hotels and restaurants with fish catch or conduct tourism activities.

On the positive side, anecdotally, the pressures on the marine environment and ecosystems from associated human economic activity have been reduced – no cruise ships calling, less effluent from hotels and other resorts, lower demand for food consumption (including marine life), lower activity in the marine settings etc.

The COVID19 paradigm may be a harbinger of the Climate Change impacts to come – exposing the deficiencies and defects in the related socio-economic systems and highlighting what form the effects of disruption can take. The opportunity should be taken to develop and implement sub-projects which provide actions that can improve resilience in the related sectors and reduce the impact on targeted beneficiaries and communities based on the COVID19 experiences.

2. The Ecosystem of the Blue Economy

2.1 Overview

The area of this study encompassed the socioeconomic activity of aquatic life – both fresh water and sea water. The latter, Ocean-related, component is central to what is classified as the Blue Economy of a country and the pre-requisite to a successful Blue Economy are healthy, vibrant, and productive marine ecosystems in a sustaining supportive environment.

TABLE 2.1 – Main Actors in the Blue Economy

ID	GROUPING	LEAD ACTORS	COMMENTS
A	Government Ministries	Ministry of Agriculture and Fisheries Ministry of Local Government etc. Ministry of Tourism Ministry of Foreign Affairs and Trade Ministry of Finance & the Public Service	NFA sub-projects may be more impactful if they link to other ongoing initiatives esp. in areas of Tourism, Climate Change and Trade.
B	Government Agencies	National Fisheries Agency (NFA)	Recently established entity
C	Fish Sanctuaries (managed by NGO's)	18 in number, legally gazetted (2018) (See Appendix 2).	Many under-resourced and in need of financial strengthening
D	Aquaculture Fish Farmers	Jamaica Freshwater Fish Farmers Assn	Remnants/legacy of a prior bigger industry - seeking revival
E	Ornamental Fish Farmers	Jamaica Ornamental Fish Farmers Assn	In abeyance, pending strategic direction & sector reform
F	Fisheries Cooperatives	Jamaica Fisherman's Cooperative Union (Treasure Beach, Half Moon Bay, Old Harbour Bay, Rocky Point, Montego Bay, Alloa, Gilling Gully, Negril)	Has 8-10 Cooperative Members nationwide with approx. 100 fishers each
G	Fisherfolk Communities	Numerous small boat operators operating nearshore; Others work the Cays (Pedro & Morant)	Depleted ecosystems and reduced fish/conch catch in recent times, limiting income
I	Mariculture Actors	NFA seeking to develop sector with caged fish species and marine agriculture	Possibilities include grouper, parrot fish, snapper, oysters, sea cucumbers, Irish (sea) moss
J	Wholesalers/Retailers of Fish Products	Rainforest Seafoods	Major importer impacting domestic market
K	Other Players in the Aquatic / Fish Sector	Suppliers of key inputs - energy, water, fuel, brood-stock, fish feed - such as: Hi Pro, JPS, etc.	Industry Inputs - Fish feed, pumps, ancillary equipment, (many US$ valued imports)

In Jamaica, the foundation blocks of the Blue Economy are the 18 Fish Sanctuaries which are growing in number and positive impact in the past decade. These Fish Sanctuaries, their management entities and the neighbouring Fisher Communities are critical to the slowing and reversal of Jamaica's damaged marine ecosystems. The current Fish Sanctuaries are listed in Appendix 2.

Fish Sanctuary operations were recently reviewed in a USAID funded project[2] and although good progress has been made, as evidenced by their increase in numbers, they remain vulnerable because of insecure sources of finance and persistent under-resourcing. They require viable Business Models of operation to buttress their financial security, and a more supporting commercial infrastructure needs to be developed. Additional and diverse sources of income are urgently needed to safeguard their vital role in developing the Blue Economy of Jamaica. This is discussed further in the next section of this report.

[2] A Capacity Assessment and Management Effectiveness Evaluation of the Jamaica Fish Sanctuary Network – USAID (Oct 2017)

2.2 Fish Sanctuaries & Marine Protected Areas

In 2009, the government of Jamaica created nine (9) Special Fishery Conservation Areas (no-take Fish Sanctuaries) in multiple locations around the island and, as of 2017, these had expanded to 18 fish sanctuaries with one additional site pending formal designation from the Jamaican Government (White River).

These Fish Sanctuaries form the network of legally gazetted protected areas around the island, designed explicitly to restore locally valuable fish populations throughout the coastal and marine environment. Of these 18 sites, there are eight (8) Fish Sanctuaries which are supported by Government of Jamaica subventions, delivered through the NFA Budget, and these are shown in Table 3.2 below.

TABLE 2.2 – Fish Sanctuaries supported by GOJ (NFA)

ID	FISH SANCTUARY	MANAGING ORGANISATION	CORE BUDGET (JA$M) 2017	YEAR EST.
1	Oracabessa Bay	Oracabessa Bay Foundation	4	2009
2	East Portland	Alligator Head Foundation	19.4	2016
3	Galleon	BREDS Foundation	4.4	2009
4	Bluefield's Bay (BB)	BB Fisherman's Friendly Society	6.8	2009
5	Montego Bay Marine Park (MBMP)	MBMP Trust	21	2009
6	Bowden Harbour	National Fisheries Agency (NFA)	2.6	2009
7	Southwest Cay	CCAM Foundation	0	2012
8	PORTLAND BIGHT - Salt Harbour - Galleon Harbour - Three Bays	CCAM Foundation	 4.4 4.4 4.4	 2009 2009 2009

[A full listing of all current Fish Sanctuaries is shown in Appendix 2.]

Noe: In addition to Special Fishery Conservation Areas, there are several other Marine Protected Areas – such as the Negril Marine Park - and 4 internationally recognised, Ramsar wetland sites located across the island, including one at Palisadoes/Port Royal, just outside Kingston.

Some Fish Sanctuaries receive additional income from successful project bid tenders and/or vested interest stakeholders – such as major players in the tourism sector (e.g. Sandals via the Sandals Foundation) or philanthropic non-residents with properties/business interests in the country (e.g. Francesca von Habsburg of the Alligator Head Foundation). To date, these Fish Sanctuaries with multiple alternative and diverse income streams tend to benefit visibly from more reliable & significant, sustainable, longer-term funding.

The 18 Fish Sanctuaries are in different stages of development, financial security and sustainability and although much good work has been done with ecosystem restoration, conservation, management and engagement with local neighbouring fisherfolk communities, there is a significant danger that this will be lost, particularly in the present ongoing challenging financial context of the COVID19 pandemic. Such a scenario would be devastating to the further development of the country's nascent Blue Economy transformation. Already it has been indicated that wardens and field workers in some of these Fish Sanctuaries are working at times without timely receipt of their anticipated pay.

Way Forward - Next Phase of Sanctuary Development

In their short life span to date the Fish Sanctuaries have played an important role in safeguarding the further loss of Jamaica's Blue Economy foundation of decimated and dying ecosystems – coral reefs, mangroves, seagrass beds – through working with the local fisherfolk communities on the island's coastal regions.

With adequate funding, the current activities could be further extended to catalyse the procreation of nature and accelerate the ecosystem recovery process. Restoration is being presently pursued with planting of coral gardens using coral nurseries established in one or two of the Fish Sanctuaries and with the "shepherding" of naturally returning female turtles through their egg laying, birth and hatchlings release process. Mangrove restoration actions are also currently being explored by some Fish Sanctuaries.

The next step would be to give local native fish a helping hand - such as re-populating and rewilding the local fish stocks within these sanctuaries, with appropriate small fry and/or fingerlings. The releasing of such fish into the wild from hatcheries and letting "nature take its course" in the subsequent grow-out phases, would accelerate the process of fish stock recovery which is now occurring, albeit slowly, in these sanctuaries.

There are plans for building and installing a hatchery for selected fish (see Aqua Bio Tech study[3]) which may include grouper, parrot fish, red snapper in the foreseeable future under a related, funded, World Bank project. However it would be expedient and prudent to pilot the process by securing the services of an existing hatchery (such as in Malta, Singapore, Taiwan etc) to supply fish from brood stock remotely, airfreighting the fry/fingerlings into Jamaica to pilot and simulate the repopulation strategy. This "experimentation" exercise can be performed whilst the proposed local hatchery is being built in Jamaica to better fulfil this role in due course. The feasibility for such a remote breeding, transportation and logistical exercise would of course need to be first established by talking to the relevant parties but air freight protocols for shipping fish in this manner is well established, particularly in the Far East. In addition, the mangrove forests and other ecosystems used by the baby fish need to be made available, healthy, and secure to accommodate the introduction of such fish rewilding.

Likewise, the protected area of the Sanctuaries now affords the possible locations to plant out seaweed, sea moss (Irish Moss) and sea cucumbers which will serve several purposes. It will increase the biomass of the area, provide nutrients for the fish life food chain, and serve as Fish Aggregating Devices (FADS) to shelter and attract fish life. Again, it would be useful to undertake a piloted approach to see how such prototypes work, gain practical experience, and learn lessons from such actions – for modification, adaptation, and promulgation, as and when successful. Such actions will provide additional alternative income livelihoods for members of the targeted beneficiary communities who will need to be recruited and engaged in such a sub-project's implementation and subsequent operation.

Enhancing a "Network of Sanctuaries" Developmental Approach

The 17 Fish Sanctuary entities now have substantial amount of real-world experience and expertise to strengthen their income generating and funding model. Even pre-COVID19, the funding for many of these Sanctuaries, and the NGO's managing them, has been increasingly irregular, tenuous and for the most part in decline in real dollar terms (the JA$ has a historical creeping devaluation trend and many operational cost inputs are linked to a US$ value- directly or indirectly).

Sanctuaries need assistance to extend their role (size and numbers) and to strengthen their operational resilience and financial security. Only then will "continuity of purpose" and successful transformation of the socio-economic models and favourable Economic-Social-Governance ecosystem be ensured so that the Blue Economy in Jamaica has a bright future.

[3] Assessment of the Potential for Mariculture Development in Jamaica – AquaBioTech Group – MICAF Aug. 2020

A means of catalysing Fish Sanctuaries' impact would involve strengthening the overall Network capabilities leading to a shared learning, pooled resources and accelerating the transfer of knowledge and expertise from one Sanctuary to another across the island. If done properly this creates a multiplier effect and provides economies of scale and scope for appropriate activities, benefitting all parties.

Apparently there already exists an nascent, informal Network of these Fish Sanctuary entities in Jamaica – led by the Alligator Head Foundation – and this Network could be supported to become more formalised, increasing the level of engagement and livelihood support for the affiliated fisherfolk communities and Fisherman Cooperative Associations in the process.

Alternative Livelihoods for Beneficiaries

The Fish Sanctuaries, managed by NGO's, have begun the long and critical journey of rehabilitating the damaged coral reef, mangrove, and sea grass ecosystems in targeted areas offshore. In the process, they have engaged neighbouring fisherfolk community members and provided some with alternative livelihoods connected with the Caribbean Sea environs, on which these beneficiaries have depended for their livelihoods.

Income alternatives for fisherfolk, through these Fish Sanctuaries, have so far included being trained as: Lifeguards, Scuba Divers (PADI), Tour Guides, Wardens (of said Fish Sanctuaries), Project Staff Roles (part-time) on funded research and development projects.

Going forward, lessons can be learned from the experiences in other Caribbean countries regarding additional alternative livelihoods for fisherfolk and members of their community, and these include, for example:

- Serving as Water Taxis e.g. licensed and regulated as tourist boat operators
- Eco-tourism attractions and services e.g. kayaking, turtle releases
- Ecosystem services e.g. growing out of sea moss / seaweed farming
- Environmental protection services – pollution control and monitoring

Sub-Project Concept Ideas

The initial longlist of sub-project actions for supporting and developing Fish Sanctuaries includes:

- Grow additional marine life varieties – seaweed, sea moss, sea cucumbers, oysters etc. - within the Sanctuaries to accelerate the restoration process (learning from Belize and Costa Rica experiences)
- Work with interested Fisherfolk Cooperatives to develop downstream actions linked to this planting action – harvest, process, and retail related products - Irish moss drinks and other items
- Facilitate the release of fry and fingerling from brood-stock of targeted fish species which would be provided by NFA hatcheries and/or imported from leading countries globally
- Reduce the operational costs of the Fish Sanctuaries through piloting the introduction of electric boat motors (such as Epropulsion, Torqeedo, Elco) as part of a GREEN MODEL for the Fish Sanctuaries
- Engage in mangrove restoration work to prepare for the rewilding fish release actions, paying the community members for their field actions (see JAMIN procedures used previously)
- Market and offer Fish Sanctuary services and knowhow, on a commercial basis, to establish new additional fish sanctuary sites across the island (already happening informally)
- Collectively lead bid for all interested Fish Sanctuaries for a large multi-million US dollar grant to share and coordinate their actions over the next 5-10-year period
- Supplement the in-the-water monitoring and surveillance with more cost-effective use of appropriate aerial drones with video camera recording capabilities and reduce operational costs
- Conduct follow-up field assignments to monitor and measure the biomass change attained in each site. Baseline data was collected in some Fish Sanctuaries in their inception and an update exercise would be most helpful to assess progress in ecosystem restoration.

Climate Change Resilience Considerations

In addition to the direct negative effects of human incursions onsite – solid waste and sewage pollution, illegal fishing, sea floor damage - all the Fish Sanctuaries are prone to Climate Change effects arising from onshore (land) and offshore (sea) actions. These Climate Change effects include increased river sediment deposits, land-based sources of pollution, acidification of sea, hurricane winds and sea swells and sea level rising. The best that such Sanctuaries can do to is to factor these projections into the design of their infrastructure and operational practices and have Preparation Plans and a Disaster Recovery Plan that ae fit-for-purpose.

COVID19 Context

In the case of the Fish Sanctuaries the economic squeeze on the Governments Budget apparently is affecting the timeliness of the stipend payments to some of the Fish Sanctuaries to which it makes payments. This in turn has a direct impact on the staff employed there and on their effective ability to perform their job role and other activities. Unregulated activity within the Sanctuaries may therefore take place undetected and this may increase as people – short of cash – could increasingly seek to harvest marine life from the sea as a "free food" source.

2.3 Jamaican Fisherman's Cooperatives

There are 8-10 Fisherfolk Cooperatives island wide, with an average membership of about 100 fisherfolk each, which are members of the network's "umbrella" organisation – The Jamaican Fisherman's Cooperative Union. (See Table 2.1)

This Union services its Cooperative Organisation members with products and services needed to sustain their fisherfolk livelihoods. At present the Union is mainly assisting in the supply of equipment and ancillary fishing gear although it also strives to represent the ten (10) individual Cooperatives in areas of mutual interest.

Interviews revealed that the livelihoods of fisherfolk was increasingly challenging; the costs of having to spend more time out at sea, being only rewarded, usually, with diminished fish catches. This reduction in fish-catch-per-expended-effort (and higher fuel costs) was being made even more difficult within the COVID19 pandemic context. It was being compounded by reduced demand for fish overall - due to reduced tourist visitors (to Jamaica) and from locals, who now had less disposable income arising from job losses and reduced overall economic activity.

This traditional modus operandi is increasingly unviable and unsustainable and in need of reform and reimagination to a new model fit for the 21st Century. **The opportunity, and imperative, exists to engage the Jamaican Fisherman's Cooperative Union to act as a proactive coordinator to support the individual member Cooperatives progress to a new paradigm through modernisation of the sector and increased group actions.**

This involves a collective approach, investing in appropriate, new technologies – at secure, tenured landing sites - to reduce operational costs and integrate the fisherfolk into value-chain, and therefore more income, through downstream services and products. This approach would also constitute a large part of fisherfolk livelihood diversification strategy through new roles and skills acquisition. At present fisherfolk are said to have diverse forms of alternative and supplemental incomes such as operating a taxi part-time, or running a small rural bar or shop etc.

The next phase of Jamaican fisheries sector development should involve "greening" of the operations which will help reduce the costs of fisherfolk operations, better manage fisherfolk financial risks, reduce environmental pollution and improve the surrounding ecosystems. For example, the purchase of fuel is a speculative, but necessary, significant cost in that the fisherman does not know how much fish, if any, that he/she may catch on any fishing trip. This uncertain return on investment can lead to considerable indebtedness over time, trapping fishers in poverty. By transitioning gradually to electric powered outboards, in a managed and tested manner, this major cost component and financial risk can be better managed for fisherfolk.

There appears to be wastage of fish catch in some quarters whereby fish that have been caught on a particular day that are left unsold are discarded. This is an unfortunately wasteful practice which needs to be minimised, probably through provision of chilled storage facilities. The reorganising of the Fisherman's Cooperatives should also extend to assisting with collective activity for marketing and selling their fresh catch directly to the end consumer – preferably with some value-added component such as processing (filleting) or even selling as a cooked meal onsite (see Way Forward section below).

As with farming, it would appear that that fish vendors is getting more income from the fish value chain and this needs to be better balanced through a fairer pricing structure, direct selling to the end consumer by the Fishing Cooperative and/or rental of facilities to vendors who would co-locate onsite.

Alternative Livelihoods

The future role of fisherfolk needs to extend to becoming custodians of the environment in which they operate. So, in addition to fishing, they need to be assisted and educated in playing a role in conserving the marine ecosystems in which they operate and the recommended best practices for living and working in the coastal environs need to be shared with them. This includes, for example, addressing the stated bad practices of harvesting conch meat from their shells and discarding said empty shells – in situ - into the sea, out at the Pedro Cays.

Such ecosystem custodian roles should form the basis for alternative (part-time) livelihoods for fishers and these include establishing marine farming operations, where feasible. These activities could include farming seaweed (Irish Moss) and/or sea cucumbers, mangrove rehabilitation and restoration, recovering wild sargassum and rewilding or repopulating targeted areas with suitable fish fry or fingerlings (See Way Forward in Section 2.2 on Fish Sanctuaries).

As mentioned in the previous section, some Fish Sanctuary NGO's are assisting fisherfolk with skills training into alternative livelihoods such as: Lifeguards, Scuba Divers (PADI), Tour Guides, Wardens (of said Fish Sanctuaries), Project Staff Roles (part-time) on funded research and development projects.

There should be more joined up activity between the various Fishermen Cooperatives and neighbouring Fish Sanctuaries with their NGO Managing entities. This should be facilitated through World Bank funded sub-projects which would include such parties as partners in a shared project, for example 1 or 2 Fisherman Cooperatives (and/or the Cooperative Union) working with a Fish Sanctuary NGO on a sea moss farm or fish repopulating/restocking activity.

Way Forward - New Fisherfolk Cooperative Operating Model

The existing Jamaican Fisherman's Cooperatives need to be strengthened and modernised to better meet the requirements of the fisherfolk communities. In the first instance the Landing Sites, which serve as the focal point of the fishing communities operations, need to be secured and the community users need to have tenure over this property asset, before it can effectively host the proposed modernised facilities.

On the Landing Site, the existing building (or replacement building / converted shipping container etc) would be designed to operate its own renewable energy sources (solar panels etc.) such that the facility is as self-sufficient as possible. The renewable energy would provide electricity for charging electric boat motors, drones, cell phones, operate chillers/freezers for fish catches etc.

The site, if appropriate, would also house simple facilities for value-addition activities - such as fish preparation, serving meals for passing tourists and locals, community tourism activities, and other such income generation opportunities.

Such a modernised landing site / operational base would also prepare the way for evolution of local fishing to include much larger ocean-going vessels which will utilise more and modern technologies and require higher crew manning levels. This type of deep-sea fishing will require individual fisherfolk to pool resources and work together, harmoniously. Alternatively, fisherfolk may become employees of larger private companies, operating such boats – who will probably be new market entrants.

Sub-Project Concept Ideas

The proposed upgrading of operational and business models for existing Fisherfolk Cooperatives – overseen and managed by the Jamaican Fisherfolk Cooperative Union, supported by an appropriate third party - would include one or more of the following:

- Piloting of the development of a modern, secure Model Cooperative Fish Landing Site facility (at 1 or 2 locations, subject to budget) shared by all licensed and authorised fisher members and located on coastal lands that are securely tenured in an ownership structure
- Communal equipment on this site which helps the fishers keep their operating costs down – such as a Green Model based on a renewable energy, solar energy supply for recharging batteries, powering a chill storage facility, electric motors, etc.
- A community/eco-tourism, based attraction (nearby or on landing site) which serves as an outlet for processing of fish catch and the sale of value-addition products - such as a fresh fish-based restaurant for tourists and locals, retail outlet etc.
- Collective Marketing and Sales of fish catch direct to high end consumers
- Farming of sea moss etc. and/or rewilding selected fish populations into mangrove or reef ecosystems

2.4 Aquaculture Fish Farming Sector

The Commercial Aquaculture Sector in Jamaica – fresh water fish farming for human consumption – has been in existence from the late 1970's when the African origin tilapia was introduced to the island with the assistance of the USAID and the UN Food and Agriculture Organisation (FAO) for captive farming.

Tilapia is not a local fish species but is NOT considered invasive and is now well established in the diet of the local population, as it is in many countries worldwide. It is the principal locally grown fresh water fish in the Jamaican marketplace and despite many challenges and "ups-and-downs" (described below)[4] this fish species offers the best prospect for improving protein food security (and human nutrition) within the context of Climate Change, environmental and ecosystem degradation, human population pressures and other risk exposures to Jamaica. (There have been recent attempts to introduce an additional fish species - pangasius/bassa - into Jamaica, but it was not possible to ascertain the detailed outcome of this experimentation. The fish has been successfully introduced into the Dominican Republic and Haiti)

The Jamaican Commercial Aquaculture Sector has seen better days and was at its peak (1990's – 2000's) when several large farms grew tilapia – in mostly southern parishes - for processing and packaging for export (via air freight) to far flung markets such as London in the United Kingdom. During that era, the peak production of the sector was just over 8,000 tonnes (2006). The sector was principally structured around the Mother Farm Contract model whereby several independently owned farms were supported by a large player (Jamaica Aquaculture Ltd.) with a guaranteed, contracted export market. The sector's exports flourished for about 10 years and was simultaneously growing a domestic market in a steady manner. The two markets – export and domestic – jointly made the sector profitable and viable, and together grew the commercial ecosystem and sector infrastructure which remains to this day, albeit on a much diminished and unstable scale.

The demise of the Aquaculture Sector was due primarily to major changes in the global marketplace, which made exports from the Jamaican industry uncompetitive, as growing cheaper tilapia exports from Far East suppliers essentially flooded the markets across the world. When the export market from Jamaica failed, the Aquaculture Sector went into decline. Even within Jamaica, local importers were permitted to bring in tilapia food products - which were in frozen, filleted format, more affordable to a greater % of the local population, and became consumed on a more regular basis – at the expense of locally produced tilapia.

By around 2010, the export of processed locally farmed tilapia all but ceased and the sector declined with players exiting the market and the remaining companies producing smaller volumes. Tilapia fish are now grown solely – by remaining players - for domestic consumption by locals and within the tourism sector ecosystem via hotels, restaurants, etc.

The sector still suffers from many challenges including the high input costs which increase with creeping devaluation of the Jamaican dollar against the US dollar which affects the (reliable & predictable) profitability of the fish farming operations. The US$ denominated input costs relate to the price of electricity, transport, fish feed, medications, equipment etc. This devaluation effect was recoverable in the days of exporting the fish (as export sales were in foreign currency) and this undoubtedly helped subsidise the local markets growth and development. Now however this no longer pertains, and the successful remaining growers have evolved a business and operational model to control and minimise these foreign cost components, selling only to the local market.

Another issue facing some fish farmers has been stated as the supply of water on the southern plains in the Hill Run area – its availability and probably its end cost due to unsatisfactory transportation requirements.

[4] Plan for Aquaculture Development in Jamaica (2012-2025) – Carlos Wurmann G. - FAO 2011

As with any business, site location is critical to commercial viability, and this irregular water supply is hampering continuity of operations for some farmers, some of the time.

In selecting a site for establishing a fish farm it is imperative that considerations for basic infrastructure be fully understood and costed, prior to being established – e.g. reliable and low costs water supply, reliable and affordable energy, good road access, good market access, etc. Most successful fish farms have their own water supply (preferably a river source as wells might be too expensive due to pumping costs) and are located on a gradient hill side to use gravity to feed water through the system (minimising pumping costs). In any event, the operational costings for any fish farm needs to be accurately computed, to ascertain the unit cost of fish production as this is what effectively determines whether the farm is going to be competitive and will be profitable to operate.

Fish feed is the other primary cost component in the business of fish farming, influenced by feed-to-conversion ratios, loss, or wastage due to unconsumed food etc. From discussions held it is clear there is a need to improve this aspect of farm operations and in general improve the productivities and efficiencies of local fish farms.

Finally, although accurate numbers of people whose livelihoods are entirely or partially dependent on this sector are not available (last Sector study was done in 2011 by an FAO Consultant)[2] it is a strategically important sector – for national food and nutrition security - and should be a priority in the proposals for sub-projects.

Way Forward – Aquaculture Sector Development

Fresh tilapia fish and frozen fish should not be seen as direct competitors, and most local people do not have sufficient disposable income to afford fresh, locally grown tilapia fish as a protein source on a regular basis. The higher priced, fresh fish would be an occasional purchase for such persons and the more suitable market for volume sales is the up market local restaurants, hotels, and tourism sectors (unless and until export sale prospects materialise through a reinvented Sector Business Model and supporting Commercial Ecosystem).

Jamaica suffers from a high input cost structure which disadvantages local fish farmers with regards to market competition. The cost of electricity is still one of the highest in the world (derived mostly from imported hydrocarbon fuel) and other inputs such as fish meal and equipment are all linked to the US$. The creeping devaluation of the Jamaican dollar continues unabated and the only recourse to date for fish farmers to remain profitable would be to reduce the use of such US$ inputs – no/limited aeration, water pumping, chill and cold storage - or increase the sale price of their fish (in JA$).

In the conduct of this brief exercise it was not possible to ascertain how the Farm Gate price for such fresh tilapia was set in the marketplace but it is known that there are several route-to-market scenarios of how the fish gets from the farm gate to the end consumer, entailing multiple players such as fish vendors, wholesalers, retailers. The point being that the more players in the supply chain then the more % margins / mark-ups there will need to be, at the expense of the farmer selling price (which will be supressed).

An appropriate Business Model for such Aquaculture Fish Farmers needs to be defined and promoted which addresses these sector's constraints. The supporting Commercial Ecosystem and Sector Infrastructure also needs to be re-engineered to be fit for purpose in this new paradigm, which has existed for a while, where there are no fish exports earning the farmer US$ based income.

One Business Model involves obviating the need for using the expensive grid electric supply through generating one's own power – solar, wind, LNG. Another possible Tilapia Sector development – to supplement the existing Commercial Fish Farmers - would be to introduce a Community-based (non-Commercial) Aquaculture Sector for micro-scale operations aimed at rural folk growing fish in an agricultural setting for home consumption only. This model is commonplace in countries in the Far East (tilapia) and apparently Haiti (pangasius) where it helps provide the countries with food and nutritional security and optimises the overall agricultural/aquacultural farm productivities and efficiencies through a closed-loop system.

The Aquaculture Sector currently lacks the sound foundation of a stable, well resourced, "anchor Institution" (such as NCU, CMU, HEART-NTA, UTECH, UWI etc) which has an entrepreneurial, research and development capabilities and which can serve as the Custodian of the Sector's knowhow, assets, research and development, practical operations, Human Resource skills development and provide a "continuity of purpose" on a sustainable, long term basis. Existing Institution aquaculture courses do exist but are not comprehensive enough to adequately service the sectors human resource skills, knowledge, research, and developmental needs of the sector.

Such Institutional support and resources would give the Aquaculture Industry, its players and dependents more long-term stability and assurance of success in delivering on the strategic direction and growth of the sector. Working in conjunction with the NFA and existing private sector players this model of a new Aquaculture Sector ecosystem will also lead to more prosperous and diverse livelihoods in associated supply and value chain roles and jobs. The existing Freshwater Fish Farmer Association - with about 20-30 medium sized members - would appear to be well positioned to participate, if not lead, in a sub-project that incorporates such a Partnership approach.

Sub-Project Concept Ideas

Advancements in the technology can help the sector become more competitive by reducing the costs of inputs through low cost energy provision. These include solar power generation off-grid, on-site, use of solar pumps for water transport, better brood-stock, supplemental feeds made entirely from local, on-farm inputs, etc.

The other approach to ensure profitability is to position the fresh tilapia grown in a differentiated segment of higher quality, higher priced nutritious food. This will increase the market sale price which will result in it being a more occasional purchase by some consumers which is not unknow in market segmentation strategies. However, this requires a collective and coordinated approach if supplying say into the tourism sector, on a limited capacity, to the top end hotels (probably NOT suitable for the All-Inclusive Hotel Business Models which are overtly cost conscious)

Suitable sub-project concepts for this sector which would meet the challenges of Climate Change and facilitate opportunities for alternative livelihoods for related communities include:

- Design and develop of a pilot demo for a new Community-based Aquaculture Sector
- Model Farm demonstrating reduced input costs with renewable energy supply (solar, wind etc)
- Positioning and collective marketing the tilapia fresh fish as a quality product at a price higher than the frozen imports
- Adding value to the fish farmed to further differentiate it in selected target markets
- Contract supplying directly to tourism (US$) based market segments
- Development of production capacity for better, more cost-effective, local Fish Feed alternatives to supplement or replace expensive import content feeds

Climate Change Resilience Considerations

The experience of other countries regarding the effect of Climate Change on inland freshwater fish farms, include reduced fish growth rates, increased fish mortality and overall decline in productivity on tilapia fish farms. This has been attributable to higher ambient air temperatures and related water dynamics. Measures at ensuring greater resilience to these effects have included: breeding and use of hardier fish varieties, digging deeper ponds, increasing shade cover to the open ponds, supplying fish at an older age into the grow out ponds to improve survival rates.

Depending on the fishpond design, layout and location, other Climate Change effects on aquaculture farm operations include flooding leading to pond overflow, fish stock loss, escape of fish into open local ecosystems and disruption to business continuity.

Another option to help address Climate Change adverse actions would be to introduce a hardier tilapia fish variety or fish species (pangasius) in the country through breeding programme on island or imported via air freight.

COVID19 Context

During the ongoing, current COVID19 pandemic, it has been observed, by those in the trade, that the price for locally grown tilapia fish, and the volume of its sales, have both increased significantly. Farm gate prices have apparently risen from JA$2.50 to JA$3.50 per pound during the period March 2020 to October 2020 – a 20% increase in price. It was not clear what this was attributable to although there was a disruption to the fish hormone imports at the time. It should also be borne in mind that, under President Trump, the USA imposed punitive tariffs on the Chinese frozen tilapia exports during 2019/20 has led to a decline in China's tilapia fish sector and increased prices of their products in the USA.

The domestic sector still contends with the importation of competing tilapia, by local companies in large volumes, from the Far East (Vietnam, China etc). These frozen tilapia fillets should not be considered a direct market competitor to fresh local tilapia – of an inferior quality and sold at a much cheaper price. However, changes to these external markets can have an impact on the local economy and need to be better understood and monitored through market intelligence. Furthermore, the policies and practices of the Jamaican Government regarding imports and trade (tariff and non-tariff barriers) can significantly impact the operations and viability of local fish farming business and these will need to be considered in any future sector development strategy.

2.5 Ornamental Fish Farming Sector

Although Ornamental Fish Farming has been present in Jamaica since the 1970's it is still an immature and unstable sector in which to make a secure living, some 50 years later. It has been stated by those in the sector that people, over the years, join it and leave it – sometimes several times. Nevertheless, the number of ornamental fish farmers has grown to an estimated several hundred operators, mostly small-scale, sole operators based in their urban city home residences.

The key representatives and players in the sector include: TCC (The Competitiveness Company), The Jamaican Ornamental Fish Farmers Association (in abeyance, previously led by Mr Norman Dawson) and a recently formed group led by Mr Chris Higgins and Devearn Breckenridge. The latter two entities were interviewed as part of this Situational Analysis process.

The local market in Jamaica for ornamental fish is small in size and value, particularly compared to the potential export market which has had periods of success over the years. In particular, the President of the Jamaican Ornamental Fish Farmers Association (JAFFA) – Mr Norman Dawson – had a period of successful exporting from his medium sized farm in St Thomas in the 1990's. However, the composition and structure of this sector, locally, has morphed into an entirely different model which appears very disparate, diverse and said to lack "cohesiveness".

In the late 1990s & early 2000's, there was expansion of the sector through the development of small urban micro-businesses (backyard operations) in the corporate area of Kingston, St Andrew and St Catherine. This was accomplished with the support of funding from international development agencies such as USAID, the European Union & IDB. The sector underwent a period of expansion and contraction as evidenced by the number of farmers registered by JOFFA over the years – 50 (2001); 184 (2002); 70 (2004)[5]

At present the sector is moribund and fragmented, with fractious relations between the main players that has led to dysfunctional outcomes, constraining the growth and development of the sector. Trust is low between some parties and it appears that there is no one active, influential entity providing clear strategic direction or adequate leadership to move the sector forward.

It is understood that a dominant buyer overseas (Seagasse) and a sole (aggregating and coordinating) exporter locally (TCC) has played a key role in maintaining the rather limited export trade to the USA (Florida) and Canadian markets. Such a market structure usually does not favour good terms of engagement of the smaller fish farmers who serve as suppliers to these players and will have limited negotiating power.

The comparative advantage of the Jamaican sector (whose principal competition is from Far East countries and, increasingly, other Caribbean countries) is with its proximity to the North American markets, and in particular Florida. The appearance, quality and health state of the live fish being supplied to overseas buyers is more likely to be better than those from more distant suppliers.

A comprehensive report done many years ago, as part of the "Plan for Aquaculture Development in Jamaica (2012-2025)", identified the many issues and constraints present in the Ornamental Fish Sector and it appears that these still hold true today. The disparate sector was, and still is, in need of better organisation, coordination and consolidation of supplies and lacks a strategic direction. The previous study did not explore the business models of the operations nor the economics of the commercial infrastructure and wider sector ecosystem required for it to flourish. Its recommendations, still valid, would not be beneficial if they were to be implemented piecemeal and the magnitude of the sector transformation required for success can be viewed as daunting. Although a detailed investigation of the commercial viability of the sector was not possible in the given timeframe (and it was also outside the scope of this assignment) certain fundamentals are known, from experience of the Jamaican business farming context.

[5] Plan for Aquaculture Development in Jamaica (2012-2025)

The Ornamental Fish Farmers are operating with a high cost input base – electricity, water, fuel, feed, and equipment (all imported and/or based on a US$ price) are expensive. To be commercially competitive and operate a viable business requires reducing/managing these cost AND selling (at least in part) into a US$ tiered market (exports, tourism sector, etc.) to keep pace with inflation arising from a creeping Jamaican dollar devaluation. The domestic market for sales is typically too small and prone to economic shocks limiting disposable income such that economies of scale, necessary for larger scale investments, are not reliable.

The sector structure can work best with a Mother "Anchor" Farm(s) which provide a reliable "core volume" of "critical mass" supply for export. This 100% reliability of minimum regular supply of fish is a non-negotiable requirement to participate in selling to the export market. The weakness in this model is that the relationship between the bigger anchor farmer serving as aggregation entity and the smaller fish farmers, must be managed well – through good time and bad times - and survive long term, being based on fairness and trust.

In addition the overseas markets (and the sector would need to export to be viable) is dynamic and has very demanding requirements - phytosanitary standards, fish quality, consistency of supply, minimum order size, regular frequency of reliable delivery to name a few. Access to air freight space and frequency at an affordable price also means dependence on third party airlines (live fish need to be exported with good survivability rates assured).

All in all, the development of the ornamental fish sector in Jamaica requires a long-term commitment - say 8-10 years – with appropriate funding, human resource development, stable adequate infrastructure and proactive responsiveness to destination market dynamics.

The NFA itself could play a part in the source supply of ornamental fish - brood-stock, fry, and fingerlings – taking the responsibility to proactively keep pace with evolving global demand for fish varieties and species. It would need active support from, and ongoing engagement with, a local (Tertiary) Institution – such as HEART, UTECH, or NCU – to ensure long term "continuity of purpose", adequate human resource, continual human resource skills development etc. The provision of a committed, extension worker service would need to be provided by the Partnership involved.

The historical Business Model for individual Ornamental Fish Farmers in Jamaica requires a major rethink and innovation. For example, there are possible options to improve overall profitability such as:

a) Cost Saving Renewable Utility Systems

Use of solar panels and/or solar pumps to reduce the energy and water bill. Rainwater harvesting to reduce water costs

b) Export Development

More selective & diverse fish types, different/additional markets abroad (including CARICOM & EU), more value-add services, etc

c) Additional income generating/cost saving activity

Using their operational knowhow of aquatic systems and the existing equipment expand into home-based aquaponics to grow vegetables etc for own consumption, use in supplemental fish feed or for sale to others

Alternative Livelihoods

The predominant current "backyard" ornamental fish farmers appear to be operating a portfolio livelihood in which their fish sales are only one source of income for these individuals – prudent under the circumstances. They are de facto entrepreneurial, some with limited educational attainment with restricted access to the commerciality aspects of this evolving global dynamic market. These are considerations to be borne in mind with respects to proposing and developing alternative livelihoods for this beneficiary group. At the same time, the options for the current farmers, in terms of alternative livelihoods, would best be done in activities which also strengthen the sector through measures that:

- Reduce the costs of the ornamental fish farmers operations (Water supply, Electricity supply, local Fish feed sources)
- Increase the income potential to the farmers themselves (improved & diverse brood stock, additional markets)
- Diversify their income opportunities through related activity in the supply chain or value-add chain connected with the sector

Way Forward

In order to develop a more profitable Operational Model for the ornamental fish farmer, there is a need to strengthen the capacity for collective action in the sector through identification of stakeholder's strengths and competences, shared sense of purpose and matching business ethics. This has started to some extent in recent years but there is a need to engender greater trust between sector participants in the supply chain through greater visibility of commercial transactional information, better communication, and constructive teamwork. It may be that lessons can be learned from the successful formation and operation of Cooperatives in the Jamaican bee-keeping sector to foster Cooperatives in this sector.

In addition, the long term commitment and meaningful, practical involvement of one or more established local Institutions – such as HEART, JBDC, UTECH, NCU, UWI etc. – to serve as custodians for the knowhow, technical expertise, innovation, and human resource development, needs to be secured. The Ornamental Fish Sector will be provided with better continuity of purpose with such Institutions playing this important role, possibly working jointly with the NFA.

The NFA itself needs to determine its specific role in the enhanced sector infrastructure and be adequately resourced to fulfil it. What can work well is that the NFA has responsibility for ensuring the provision of diverse brood stock, fingerlings, and/or fry for the fish farmers to grow out, at their own risk and cost. Apparently, there is a facility in place at an NFA site which could be utilised, in conjunction with HEART, to serve this purpose and serve as a Model Urban Farm operation for training purposes.

NFA should also work together with the Institutional actors to develop certified local supplemental fish feed alternatives, provide extension services, support quality assurance, and develop proactive market intelligence.

Sub-Project Concept Ideas

A Prototype Model of Excellence of an ornamental fish farm needs to be designed, developed and promoted to existing fish farmers to address Climate Change issues to build in resilience and better ensures the viability of the sector, whilst improving its chances of profitability. This Model should be appropriate to the local context and preferably include modern technology innovations for climate change resilience, such as rainwater harvesting, solar energy, solar pumps, aquaponics knowhow, local fish feed mix formulae etc.

Climate Change Resilience Considerations

The impact of Climate Change on this sector will depend on the circumstances and location of the Ornamental Fish Farmer. However, the outdoor siting of the fish tanks and associated infrastructure means that both small-scale urban backyard farmer and rural farmers will be exposed to the weather vagaries brought about by extreme Climate Actions. The farmer may experience periodic disruptions to their power and water supplies and/or destruction of their fish tank infrastructure in the event of a major hurricane strike. They may also experience flooding of their property on occasions of storms which are expected to increase in intensity and frequency.

On another dimension the expectations are that the ambient outside temperature will increase over time which will probably lead to an increase in mortality among the fish and a decline in their overall profitability due to stress, slower growth rates etc. The operating costs linked to the sector will also probably increase such as electricity and water.

To prepare for these future Climate Change scenarios, the farmers should anticipate these challenges and factor in solutions through the design and layout of the farm's infrastructure. They should also have in place disaster recovery plans and resources so that the disruption to business continuity is minimised.

Resilience can be achieved in several ways:

- Careful selection of more hardier type fish species and varieties
- Smart Climate redesign of the farm operational model
- Multiple back-up options of the critical operational assets (e.g. own power source, water reservoirs)

3. Sub-Project Conceptualisation

3.1 Beneficiary Considerations

The focus of this assignment is on the vulnerable and marginalised persons who make their living precariously, in the aquatic based sectors of fisheries, aquaculture and mariculture. These are diverse domains which include inland freshwater fish farms (mainly rural), open sea marine fishing (near shore and far shore, cay banks) and urban tank fishing. A common theme they share is that the people are mostly making their livelihood as small, self-employed operators with exposure to the effects of Climate Change.

The feasibility of alternative livelihoods will depend on the competences, skills sets, expertise and knowledge of the persons in question as well as their resource base, willingness, and ability to receive training and adapt to the new opportunities proposed.

One approach would be to expand the roles of the beneficiaries in their existing domain of work – opportunities in the supply chains, value chains, wider related sectors which connect with their current livelihoods.

Their default preference may be to remain operating in a self-employed capacity and/or to work part-time as an employee for a third party whilst still having an option to be operating autonomously within their traditional job.

3.2 Other Considerations

Given the current state of the Sectors targeted in this assignment, the types of sub-project interventions that would be most appropriate are those which help attain the significant Business Model and Commercial Ecosystem transformations required. There is little point of continuing to do more of the same historical activity and expecting different outcomes. What is required is exploring new horizons – new technologies, new market development, new operations and livelihoods, preferably related to the supply and value chains of existing sectors, such that beneficiaries can be transitioned into the new Blue Economy paradigm.

Many of the entities that act on behalf the collectives in each Sector are not adequately resourced to manage the execution of the proposed sub-projects; some are not legally constituted, and others have limited human resources and/or weak skills capacity to deliver. In addition, the complex and multi-dimensional nature of the challenges being faced necessitate a “partnering approach” with several stakeholder entities working together to provide the combination of skills and expertise to execute the project activities and this should be incorporated in the design of the sub-projects where practicable.

It would be ideal if the other World Bank projects, which are being simultaneously implemented under the same Programme, could be considered whilst developing the shortlist of projects – to maximise the overall impact on the sector. For example, the development of an NFA Hatchery capability to breed new marine life for launching a new Mariculture Sector (grouper, snapper, sea moss farming, sea cucumber farming) could offer additional options with regards to alternative livelihoods for targeted beneficiaries.

In considering the sub-project implementation and administration aspect, the available World Bank funding of US$1.5 Million can be disbursed across any number of support initiatives or sub-projects. The minimum / optimal size of each sub-project will be determined by the consideration for economies of scale. The human resource, effort and cost taken to manage a US$100k project is the same as it takes to manage a US$300k project. At the same time there are dis-economies of scale if one were tasked to manage too many projects – say 10 sub-projects instead of 5 sub-projects, and programme management inefficiencies would be an issue in the delivery stages.

Therefore, with a total budgetary allocation of US$1.4875 million available, the working assumption for now will be to take an average size of the sub-projects of about US$250k – resulting in a total of about 5-6 sub-projects.

4. Prospective Project Concepts Outlines

In summary, following the findings to date through this Situational Analysis, a longlist of prospective project concepts is carried below which have been taken from the preceding narrative of the various sections of this report. These are based on the indications made in the preliminary Zoom discussions with the respective stakeholders. In some cases, the eventual sub-project concept note may incorporate a merger between two or more of these initial concepts, which will facilitate joined up, partnering actions between relevant stakeholders, for greater impact and outcomes.

Fish Sanctuaries

- **Grow additional marine life varieties** – seaweed, sea moss, sea cucumbers, oysters etc. - within the Sanctuaries to accelerate the restoration process (learning from Belize and Costa Rica experiences)
- Work with interested Fisherfolk Cooperatives to **develop value-added downstream activities linked to this planting action – harvest, process, and retail related products** - Irish moss drinks and other items
- **Rewild/Repopulate - facilitate the release of fry and fingerling from brood-stock of targeted fish** species which would be provided by NFA hatcheries and/or imported from leading countries globally
- Reduce the operational costs of the Fish Sanctuaries through **piloting the introduction of electric boat motors (such as Epropulsion, Torqeedo, Elco) as part of a GREEN MODEL** for the Fish Sanctuaries

Fisherman's Cooperatives and Fisherfolk Communities

- Piloting of the design and build of a modern, secure **Model Cooperative Fish Landing Site facility** (at 1 or 2 locations, subject to budget) shared by all licensed and authorised fisher members and located on coastal lands that are securely tenured in an ownership structure
- Installing **communal equipment** on this site which helps the fishers keep their operating costs down – such as a **Green Model based on a renewable energy, solar energy supply for recharging batteries, powering a chill storage facility, electric boat motors**, etc.
- **Pilot community/eco-tourism, based attractions** (nearby or on landing site) which serves as an outlet for processing of fish catch and the sale of value-addition products - such as a fresh fish-based restaurant for tourists and locals, retail outlet etc.
- **Collective Marketing and Sales of fish catch direct to high end, small volume consumers – Elegant Resorts type**
- **Farming of sea moss etc. and/or rewilding selected fish populations** into mangrove or reef ecosystems – in conjunction with nearby Fish Sancturary NGO's

Aquaculture Sector

- Development of a pilot demo for **a new Community-based Aquaculture Sector (pangasius, tilapia**)
- Pilot Model Farm techniques demonstrating **reduced input costs with renewable energy** (solar, wind etc)
- Positioning **and collective marketing the tilapia fresh fish as a quality product at a price higher** than the frozen imports
- Adding value to the fish farmed to **further differentiate** it in selected target markets
- **Contract supplying directly to tourism (US$) based market segments** through aggregation of supply
- Development of production capacity for better, more cost-effective, local Fish Feed alternatives to supplement or replace expensive import content feeds

Ornamental Fish Farming

- **Mobilise a Partnership approach involving NFA, JBDC, HEART & JOFFA and stage a Roundtable discussion** to feed into the development of a LONG TERM Strategic Plan for the Ornamental Fish Sector (This needs to be done on a market segment basis to accommodate the diversity of this disparate group)
- **Conduct Market Research and Intelligence gathering to identify external export markets** which are non-traditional to this segment which may better meet needs of smaller farmers. Also gather local information and data to capture the present state of the ornamental Jamaican fish farming sector
- **Implement operational costs saving techniques by applying modern innovative technologies** - rainwater harvesting, solar energy, solar pumps, aquaponics knowhow, local fish feed mix formulation, advisory extension services via cell phone, What's App group etc. into this model. This Urban Farm Demo Model could be established at the existing NFA site and led by HEART/NFA/JOFFA/JBDC.

Appendix 1 – References in Literature Review

1. Assessment of the Potential for Mariculture Development in Jamaica – AquaBiotech Group (August 2020)

2. The National Agri-Business Strategy for Jamaica (2020-2025) – Newer Worlds; Vernon Barrett (June 2019)

3. Ornamental Fish Farming in Jamaica – USAID; Dr Juli-Anne Russo & Dr Ricccardo Russo (December 2006)

4. Marketing Plan for Jamaican Ornamental Fish Industry – Krishen Rana University of Stirling (2002)

5. Promoting Community Based Climate Resilience in the Fisheries Sector Project - The Pilot Program for Climate Resilience of the Strategic Climate Fund (PPCR) - World Bank / IBRD [PP2520] (February 2018)

6. Promoting Community Bases Climate Resilience in the Fisheries Sector – Environmental & Social Management Framework – Fisheries Division (MICAF); Eleanor Jones (September 2017)

7. Caribbean Marine Biodiversity Program Cooperative Agreement No. AID-OAA-A14-00064 - Final Report (October 2014–September 2019)

8. Caribbean Marine Biodiversity Program Report: A Capacity Assessment and Management Effectiveness Evaluation of the Jamaica Fish Sanctuary Network – USAID (October 2017)

9. Final Synthesis Report & Executive Summary: Promoting community-based climate resilience in the fishery sector project: "Pilot Programme for Climate Resilience (PPCR)" - SCF-PPRC TF0 AO726 Jamaica; Mr. Gianluigi Negroni (March 2017)

10. The Blue Economy: From Concept to Reality in the Caribbean Region – Commonwealth Secretariat

11. Community-based Live Fish (CLIF) Monitoring Results: Interim Report (2012-2014).

12. The CARIBSAVE Partnership, West Indies. Day, O.D., Eristhee, N., McNaught, M., Lee, S. & Guyah, N. (2015).

13. National Aquaculture Sector Overview: Jamaica – Food and Agriculture Organisation of the UN (2005)

14. Oracabessa Bay Fish Sanctuary Management Plan (2019)

15. C-Fish Community Tourism Development Project – Galleon Fish Sanctuary (May 2016)

16. Creating a Fish Sanctuary Network in Jamaica – UWI Department of Life Science – Karl Aiken, Oliver Squire, Andre Kong, Stephen Smikle (November 2011)

17. USAID/Competitiveness, Markets, Investment & Trade Project – Final Report (November 2007)

Appendix 2 – Fish Sanctuaries in Jamaica (2017)

ID NO.	SPECIAL FISHERY CONSERVATION AREA	MANAGING ORGANISATION	YEAR EST.	SIZE (Sq Km)	EMPLOYEES	BUDGET (JA$M)	AREA	PARISH
1	East Portland	Alligator Head Foundation	2016	6	4 (+4)	123	East Portland	Portland
2	Discovery Bay	Alloa Fisherman's Association	2009	2	6	4.4	Discovery Bay	St. Ann
3	Bluefields Bay	Bluefields Bay Fishermen's Friendly Society	2009	12.36	12	7.2	Bluefields Bay	Westmoreland
4	Galleon	BREDS, Treasure Beach Foundation	2009	2.53	5	4.4	Galleon	St. Elizabeth
5	Galleon Harbour	CCAM Foundation	2009	17.14	8	4.4	Old Harbour	St. Catherine
6	Salt Harbour	CCAM Foundation	2009	10.66	8	4.4	Hellshire	St. Catherine
7	Three Bays	CCAM Foundation	2009	12.03	8	4.4	Salt River	Clarendon
8	South West Cay	CCAM Foundation	2012	13	8	20.6	South West Cay	Pedro Bank
9	Bogue Island Lagoon / MoBay Marine Park	Montego Bay Marine Park Trust	1979	4.5	14 (+5)	24	Bogue	St. James
10	Airport Point	Montego Bay Marine Park Trust	2009	3.5			Airport Point, MBJ	St. James
11	Orange Bay	Negril Area Environmental Protection Trust	2011	5.35	5	5	Orange Bay	Hanover
12	Oracabessa Bay	Oracabessa Bay Foundation/ Fisherman's Group	2009	0.75	3 (+7)	10	Oracabessa Bay	St. Mary
13	Sandals Boscobel	Sandals Foundation	2009	1.25	7	3	Boscobel	St. Mary
14	Sandals Boscobel East	Sandals Foundation					Boscobel	St. Mary
15	Sandals Boscobel West	Sandals Foundation					Boscobel	St. Mary
16	Sandals Whitehouse	Sandals Foundation	2012	3	7	N/A	Whitehouse	Westmoreland
17	Bowden Harbour	National Fisheries Agency (NFA)	2009	0.597	6	2.7	Bowden	St. Thomas
18	White River	White River Marine Association	2018?	1.5	1+	17	White River	St Ann

Appendix 3 – List of Interviewees

ID. NO.	ORGANISATION NAME	CONTACT PERSON	TITLE	STATUS	COMMENTS
Associations, Cooperatives and Fish Sanctuaries					
1	BREDS-Galleon Sanctuary	Luke-Ben Brown	Sanctuary Manager	Completed (13/10)	Spoke ith Ms Luke-Ben Brown
2	Alligator Head Foundation	Nickie Myers	Sanctuary Manager	Completed (21/10)	Spoke with Mr Machel Donegan
3	Oracabessa Bay Fish Sanctuary	Inilek Wilmott	Sanctuary Manager	Completed (13/10 &2/11)	Spoke with Mr Inilek Wilmott
4	Gillings Gully Fishermen Co-operative	Denise Blackwood	Manager	Completed (27/10)	Spoke with Denise Blackwood
5	Green Island Fishermen Group	Mr Bowen	President	Completed (26/10)	Spoke with Mr Bowen
6	Jamaica Fisherman's Co-operative Union	Ms Ionie Henry	General Manager	Completed (15 & 20 /10)	Included Glaston White & Ionie Henry
7	Jamaica Freshwater Fish Farmers' Association	Dr Vincent Wright	President	Completed (23/10	Spoke to Dr Wright
8	Jamaica Ornamental Fish Farmers' Association	Mr Norman Dawson	President	Completed (27/10)	Spoke with Mr Dawson
8a	Ornamental Fish Sector Representatives	Mr Chris Higgins		Completed (13 & 20/10)	Included Chris Higgins & Devearn Breakenridge & Ms Gray
8b	***The Competitiveness Company***	***TBA***		***TBC***	***Speak with NFA***
Social Development Agencies					
9	Planning Institute of Jamaica	Mrs Nadine Brown	Director - Sustainable Development	Postponed	Awaiting new dates from Ms Barbara Scott
10	JSIF	Omar Sweeny	MD	Postponed	Awaiting new dates from Vincent Thompson
Government Ministries & Agencies					
11	Minister of Agriculture & Fisheries	Mr Floyd Green	Minister	Ongoing	Listened to ZOOM webinar -Trelawny Fisherfolk (24 Oct)
12	Minister of Tourism	Mr Edmund Bartlett	Minister	TBA	Consult Minister re Blue Economy Linkages
13	Dept. Of Cooperatives & Friendly Societies	Paulette Kirkland	Director of Policy, Research, Training and Development	TBD	May not be feasible in timeframe
14	Tourism Product Development Company	Mrs A Chung	Director	TBA	Need to identify correct person in TPDCO
15	***HEART-NTA***	***Dr Janet Dyer***	***Senior Director***	***Awaiting response with date***	***Pending***
16	Port Authority of Jamaica	Mark Hylton	Manager	TBA	Need an introduction to Gordon Shirley to discuss PAJ interaction with fisherfolk/boats
17	NEPA	Mr Peter Knight	CEO	TBA	Get an introduction to NEPA
17a	***Forestry Department***	***Ms Oliphant***	***Acting CEO***	***TBA***	***Discuss mangrove initiatives planned with EU funds***
17b	JBDC	Ms Valerie Viera	CEO	Completed (4/11)	Spoke to Ms Veira & Mr Davis
17c	CASE	Dr Derrick Deslandes	President	***TBA***	
17d	CMU	Joachim Schmillen	Executive Director	Completed (2/11)	Spoke to Mr Schmillen
Financial Institutions					
18	Jamaica Business Fund	Lushana Francis	TBA	Postpone	Awaiting new dates from Lushana Francis
19	REDI (II)	Kameisha Batcham	Project Manager	Postpone	See JSIF above who administer REDI (item 10)
20	Tourism Enhancement Fund	Dr Carey Wallace	Executive Director	Completed (12/10)	Awaiting info from Johan Rampair
20a	***Jamaica Social Stock Exchange***	***Ms Marlene Street Forrest***	***CEO***	***TBA***	***Discuss Social Enterprise/Stock Exchange fund raising***
Private Sector					
21	PSOJ	Mr Keith Duncan	President	TBD	May not be feasible in timeframe
22	Sandals Foundation	Mr Adam Stewart	President	TBD	May not be feasible in timeframe
23	Branson Centre for Entrepreneurship (Caribbean)	Ms Lauri-Ann Ainsworth	CEO	Completed (22/10)	Awaiting info via email from Lauri Ann
Global Institutions					
24	World Bank	Ms Maja Murisic	Team Task Leader (Washington)	Completed (14/10)	Awaiting info to be emailed from WB
25	FAO	Dr Crispim Moreira	Country Representative	TBC	In email contact with Ms DieiOuadi (Barbados FAO)
26	European Union	Stefano Cilli (or successor)	EU Officer responsible for Fisheries/Environment	Completed (14/10)	Forestry Dept to be followed up (see 17a)
Ongoing Marine Climate Change Projects					
27	SODECO (UWI-Mona)	Prof. Terrence Forrester	Managing Director	Initial Contact made	May have constraints from project terms
28	BE-CLME+ Project	CRFM/GEF/CERMES (UWI)	TBA - identify POC	Postpone	
29	The Nature Conservancy	Donna Blake	Director	Completed (15/10)	

INCEPTION REPORT

Consultancy to Identify Sub-Projects on Climate-Resilient Freshwater Aquaculture, Coastal Mari-culture/Polyculture, and Other Alternative Livelihoods

Project: **Promoting Community Based Climate Resilience in the Fisheries Sector Project**

(Ref. No. TF0A6559)

Client: **Ministry of Agriculture & Fisheries**

Government of JAMAICA

Vernon "Patrick" Barrett

September 2020

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1. Introduction

1.1 Background

The Ministry of Industry, Commerce, Agriculture and Fisheries has secured, through the Government of Jamaica, funding from the International Bank for Reconstruction and Development (IBRD) for the execution of the composite, multi-faceted Project entitled - "**Promoting Community-based Climate Resilience in the Fisheries Sector"** - aimed at enhancing community-based climate resilience among targeted fishing and fish farming communities of Jamaica.

The key outcomes expected from the Project include:

1. Strengthened and climate-smart fisheries and aquaculture policy and regulatory framework
2. Reduced vulnerability of the targeted fishing and fish farming communities to climate shocks; and
3. Diversified and strengthened livelihoods of targeted artisanal fishers and fish farmers.

The above-mentioned outcomes will be accomplished through the following components:

1. Strengthening the Fisheries and Aquaculture Policy and Regulatory Framework
2. Diversification, Alternative Livelihoods and Aquaculture for Sustainable Fisheries and Aquaculture including Community-based Aquaculture, Coastal Mariculture/Polyculture, and Artisanal Longline fishery for Pelagic species; and
3. Capacity Building and Awareness Raising including Training, Support to fishers' and fish farmers' organizations, and Awareness building and behaviour change.

The entire Promoting Community-Based Climate Resilience in the Fisheries Sector Project is to be executed over a 5-year period by the Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF).

The tender to execute the Consultancy entitled "Identify Sub-Projects on Climate-Resilient Freshwater Aquaculture, Coastal Mari-culture/Polyculture, and Other Alternative Livelihoods", which forms a part of this overall Project, was secured by Vernon Barrett for delivery with initial proposed starting date of early July 2020, now revised to early September due to delays arising from the global COVID19 pandemic.

This Inception Report draft document provides a preliminary summary of the work to be executed and proposed timelines, with an expected completion date of 8 March 2021.

1.2 Purpose of the Assignment

RATIONALE

Fisheries and aquaculture are among the first sectors that will be impacted by Climate Change, therefore it is important for communities and businesses that rely on the fisheries resources, for their continued operations, to have the ability to absorb and recover from the shocks that Climate Change may bring. Ideally it is recommended that win-win situations should be pursued that build both resilience to climate change and expand opportunities to facilitate livelihoods diversification and sustainability while ensuring that the natural resource base is enhanced.

Under this broad Fisheries Project, support will be provided to fisheries and aquaculture communities enabling, where possible, the building of climate resilience and facilitating diversification or the adoption of improved fishing/farming practices. The support will assist businesses with marketing and access to finance to develop economically viable aquaculture businesses - such as tilapia and ornamental fish - and their associated value chains. It will also address the potential for the development of other value-added businesses including crafts and jewellery making using material derived from fisheries e.g. shells such as conch shells and other types of material.

OBJECTIVES

The specific objectives of the assignment are to:

1. Identify climate-resilient aquaculture sub-projects for new and existing fish farmers and climate-resilient Mariculture/Polyculture and alternative livelihood sub-projects.
2. Develop initial concepts for climate-resilient aquaculture sub-projects for new and existing fish farmers climate-resilient Mariculture/Polyculture and alternative livelihood sub-projects

1.3 Scope of Work

The Scope of Work outlined in the Contract consists of two elements:

1. The **identification of Climate-Resilient Aquaculture Sub-Projects** for New and Existing Fish Farmers and Climate-Resilient Mari-Culture/Poly-Culture and Alternative Livelihood Sub-Projects

2. The **development of Initial Concept Notes for Climate-Resilient Aquaculture Sub-Projects** for New and Existing Fish Farmers and Climate-Resilient Mari-Culture/Poly-Culture and Alternative Livelihood Sub-Projects

Identification of Climate Resilient Aquaculture Sub-Projects

This work will be performed through the following activities:

a) A Literature Review of existing mariculture/polyculture options for Jamaica. This will include outputs from previous extensive consultations, that have already been held with stakeholders to identify options for the diversification of livelihoods, which will be provided to guide in the development of Concept Notes.

b) Using the material referenced above that was produced during this project's preparation phase, additional community mobilization workshops with community groups, fish farmers and key value chain actors will be conducted to identify potential sub-project interventions. Consultations with social development and financial entities will also be performed, to investigate their roles and responsibilities within the sub-projects that are being proposed.

c) Additional consultations with MICAF, NFA and other entities, as applicable.

Development of Initial Concept Notes for Climate-Resilient Aquaculture Sub-Projects

The outputs of the previous task above will, after validation with agreed relevant stakeholders, be used to develop the Initial Concept Notes for sub-sequent presentation to the Project Steering Committee. The Concept Notes will contain information that is sufficient for the Project Steering Committee to make a decision on the feasibility of the proposed project. It will include (at a minimum) the following:

- Project Objective
- Proposed Activities,
- Recommended Budget,
- Project Timeline,
- Implementation arrangements,
- Identification of main environmental and social risks of proposed activities
- An overview of the feasibility of the sub-project

2. Activities & Proposed Methodology

The 6-month assignment will have a 4 Phased approach as described below:

- Phase 1 – Discovery & Inception Report Writing (first 2 weeks)
- Phase 2 – Situational Analysis (first 2 months)
- Phase 3 – Identification of Potential Sub-Contracts (Visioning the Future – next 2 months)
- Phase 4 – Drafting Concept Notes (Articulating the Future – final 2 months)

2.1 PHASE 1 - Discovery & Inception Report Writing

The lead consultant, Vernon Barrett met with Ms Selena Ledgister (Project Manager), Ms Smikle (Director, NFA), and other NFA/MICAF officers (see Table 1) via Zoom on August 28, 2020 for a preliminary Kick-off meeting. On that occasion the Terms of Reference was reviewed, commented on and clarification made on the previous Project Preparation assignment conducted in early 2017, which involved Mr Gianluigi Negroni.

Name	Speciality	Tel	E-mail
Mrs. Avery Smikle*	Fisheries Division, Director Aquaculture Branch, TT	876-433-0657	adsmikle@mica.gov.jm
Ms. Selena Ledgister	Project Manager	876-488-1316	smledgister@micaf.gov.jm
Mr. Dehaan Brown *	FD, Fishery extension service, TT	876-429-8033	ddbrown@micaf.gov.jm
Ms. Shellene Berry	FD, Fishery extension service	TBA	ssberry@micaf.gov.jm
Ms Mellisha C Meeks	Project Administrator	876-831-7007	mcmeeks@micaf.gov.jm
Mr Andrew Darnells	Procurement Specialist, NFA	876-948-9014	aadarnells@micaf.gov.jm
Mr Vernon Barrett	International Consultant	+4477 66664600	vpatrickbarrett@gmail.com

Table 1. List of Zoom Meeting Attendees

It was agreed that a second virtual meeting with the NFA Acting CEO, Mr Courtney Cole, would be set up so that additional individuals and stakeholders would also be identified for interviews in the early weeks of the project (Discovery Phase). This second Zoom group meeting was held on 8 September 2020 without Mr Cole who was unable to attend due to prevailing circumstances. Further contextual details were elaborated on principally by Ms Smikle who provided a list of named organisations of interest involved in the earlier PPCR project for follow up. (These names have been incorporated in the preliminary list of proposed interviewees shown in Appendix 1) A copy of the World bank Project Paper for Promoting Community Based Climate Resilience in the Fisheries Sector Project (PPCR) and thee Fisheries Draft Procurement Plan was subsequently supplied via email.

This Draft Inception Report was produced as an output of these two meetings and is combined with findings from preliminary desk research conducted by the Consultant within the first 2 weeks of starting the assignment (up to 12 September 2020). The Report is therefore to be considered a working document, subject to review after further discussions are held with key Stakeholders in the coming weeks and it will be updated on an ongoing basis.

The key individuals which have been prioritised for introduction to the consultant as soon as possible are shown in the Table 2 below.

ID	ORGANISATION	NAME OF PERSON	POSITION
1	National Fisheries Authority	Mr Courtney Cole	Chief Executive Officer
2	World Bank (Washington)	Ms Maja Murisic	Team Task Leader
3	MICAF / Ministry of Agriculture & Fisheries	Mr Dermon Spence	Permanent Secretary
4	National Fisheries Authority	TBC	Mariculture Technical Officer
5	National Fisheries Authority	TBC	Fisheries Technical Officer (Pelagic Fisheries)
6	NEPA	Mr Peter Knight	CEO

A full preliminary list of the targeted interviewees to be hopefully covered during the ensuing Phase 2, Situational Analysis, is shown in Appendix 1. This is subject to revision with the recently announced changes to some Government Ministries and Ministerial posts (following the country's national elections in early September 2020).

Points of Clarification

Arising from the initial Zoom group meetings, it was advised that, for the purposes of this assignment, the Social Development and Financial Entities referenced in this assignment's TOR would possibly include the following:

- Jamaica Social Investment Fund (JSIF)
- Social Development Commission (SDC)
- Jamaica Business Development Corporation (JBDC)

The stakeholders who would validate the proposed sub-projects would include:

- National Fisheries Authority (NFA) ***(names to be confirmed)***
- Cooperatives ***(names to be confirmed)***
- Community Leaders ***(to be identified and confirmed)***
- ***Others to be advised***

The organisations represented on the Project Steering Committee include:

- MICAF ***(names to be confirmed)***
- NFA ***(names to be confirmed)***
- NEPA ***(names to be confirmed)***
- Cooperatives ***(names to be confirmed)***
- Ministry of Finance ***(TBC)***
- ***Others to be advised***

The final details of the complete list of organisations and their named representatives will be obtained in the Situational Analysis in coming weeks.

2.2 Phase 2 - Situational Analysis (Mapping of the AS IS)

This consulting assignment, of identifying sub-projects and developing associated Concept Notes, needs to be considered and implemented in the context of several ongoing and scheduled projects in Jamaica, which are also funded by the World Bank. This context will be discerned following interview meetings that will be scheduled and conducted over in the next two (2) months.

From the discussions and material read to date, it is understood that the World Bank has committed to provide the Government of Jamaican with a total of US$4.875 million in Grant funding to conduct several projects in the coming years. This is broken down into 4 components, some of which may be inter-related or inter-connected:

1) Strengthening the Fisheries Policy & Regulatory Framework (US$0.57M)
2) **Diversification and Fisheries-based Alternative Livelihoods (US$2.68M)**
3) Capacity Building and Awareness Raising (US$0.97M)
4) Project Management & Monitoring & Evaluation (US$0.66M)

This specific assignment of identifying sub-projects and designing their Concept Notes, falls under Component 2, included within what is referred to as Component 2(a) in the World Bank Report No. PP2520 and specifically as Component 2 (a) ii (subject to confirmation).

The possible extent of the interdependency of these sub-projects designed, with other WB funded projects - and the desirability (or not) and/or benefits of such project linkages - will need to be determined with further Situational Analysis. There could be advantages but also risks associated with any such "joined-up" approach.

The size and possible (permissible) sources of the funding for the sub-projects being designed (via Concept Notes) will need to be determined and agreed with the relevant parties. This includes the World Bank and an early virtual meeting with the Team Task Leader – Ms Maya Murisic – will assist in clarifying this. For now, it appears that the amount of WB funding (total) for the Livelihood Diversification Sub-projects to be designed during this assignment is US$1,478,500 (comprised of US$800k for Aquaculture and US$678,500 for Mariculture) and that there is no specified number (minimum or maximum) of sub-projects.

The sub-projects individual funding size (or possible restriction on additional fund sourcing) will play an important factor in shaping the optimal type and size of interventions.

2.3 Phase 3 - Visioning the Future - Identification of Potential Sub-Projects

Initial investigations have revealed that a considerable number of studies and consultancies into aspects of Jamaica's Aquaculture Sector have been in progress in the past several years. The proposed extensive interview process (virtual and in-person) in this assignment will assist establishing the current state of play in the various areas of Aquaculture, Mariculture, Fisheries and Ornamental Fisheries – what has been delivered recently, what is underway and what is currently planned for the near future.

In addition, secondary research - reviewing relevant reports and project updates - will be simultaneously conducted, to supplement this primary research, developing ideas and concepts for possible sub-projects with appropriate stakeholders.

The consultant is also experienced with recent Climate Resilient Aquaculture and Blue Growth projects in other countries through his recent work with the FAO (UN) and EU project implementation and will seek to draw on this knowledge to propose possible applications, appropriately customised to Jamaica.

For example, the rate of Climate Change has been accelerating to the extent that the FAO has been supporting tilapia farmers in Philippines, Bangladesh and Sri Lanka with implementing Climate Resilient fish farming methods to reduce the increased mortality rates and declining productivity of ponds witnessed in those countries. This has had implications with the traditional value and supply chains and lessons learned from these countries may be of value to the Jamaican Tilapia sector.

In the Mariculture Sector, the seaweed farmers in Zanzibar (Tanzania) - adversely affected by Climatic Change - were assisted with pioneering a new Sea Cucumber sector through an FAO supported project. Transitioning coastal fish farmers from seaweed to sea cucumber (which is more resilient to Climate Changes) is still underway but the results are promising and could be beneficial to the Jamaican context.

Additionally the Blue Growth framework has been recently implemented as a pilot case in Cabo Verde with the support of the FAO and this will serve as a good case study for other Small Island Developing States (SIDS) seeking to transform their economic development model. The scope for alternative livelihoods for coastal communities in the Blue Economy Model is quite extensive – ranging from tourism related options to environmental protection and ecosystem conservation related options (coral reef systems, mangroves, sea-beds etc). Jamaica has been experiencing a degree of success with Fish Sanctuaries and Marine Protected Areas (MPA) recently with linkages developing between fisherfolk communities and actors in the tourism sector and so this will be further explored in the interview process.

In undertaking a Visioning approach, it is useful to simultaneously postulate Hypotheses as part of the process to provide a framework and context for directing the work focus. Some of these initial Hypotheses are listed below and these are subject to addition, elaboration, review, and fine-tuning as the Situational Analysis Phase unfolds.

Hypotheses

1. Identifying suitable sub-projects which are likely to be successful will require a sound understanding of the current context and an astute foresight of the likely future scenarios in the respective Component Areas.

2. The COVID19 Pandemic can provide opportunities to catalyse the changes necessary to restructure fishery-based livelihoods and, also pose threats to the conventional existing supply and value chains in the respective sectors. These should be better understood and factored into the sub-project proposals.

3. The Blue Economy Framework is gaining increasing local attention and international traction as a mechanism to transform traditional fisheries and coastal economies into more economically sustainable models. It facilitates enacting the dual role of coastal fisherfolk to act as custodians of the maritime and coastal environment which they depend on, and so opens new, alternative livelihood prospects.

2.4 Phase 4 - Articulating the Vision – Drafting Concept Notes

After validating the shortlist of possible sub-projects with the relevant stakeholders the consultant will prepare the outline for Concept Notes, using the recommended format shown in Appendix 2. The actual number of sub-projects is not yet determined, as this will be based to some extent on the aggregated pool of funds (World Bank and others if permissible) available for the sub-project's implementation.

However, if one assumes an initial pool of US$800k and an average sub-project size of US$200k then there may be expected to be 3-4 sub-projects and therefore Concept Notes. The sub-projects need to be of a critical mass size and scale to have any hope of making transformational impact and delivering objectives.

2.5 Proposed Methodology

The overall objective of this assignment is, within the constraints of the current Jamaican context, to identify possible sub-projects and develop Concept Notes which will be used to secure possible funding for their subsequent implementation at a later date (the actual implementation of said sub-projects is outside the scope of this project).

Methodology

Given the tight timeframe and the available research work historically done in this area, the overall approach for the consultancy will be to interview selected and diverse stakeholders both from within the associated Government Agencies and Ministries, Community Organisations, the related local private sector, the connected supply chain and value-add chain entities, the regulatory authorities. The issues, successes and challenges will be identified and/or confirmed to develop a picture of what interventions would be of most benefit and likely to be successful as it relates to the funder's objectives and scale of support.

In addition, an attempt will be made to obtain an overview of the other ongoing Jamaican initiatives in this area of Climate Change interventions relevant, to the marine and aquatic environment and sectors and their associated communities. Relevant references to other recent and ongoing projects conducted globally (by the FAO, EU-ACP and others International Agencies) with which the Consultant, Vernon Barrett, has experience with, will also be made.

The interviews will be a combination of 1-2-1 interviews (virtual and in-person) and will be followed by Focus Group Discussions with Stakeholders in groups to validate the proposed sub-projects shortlisted (COVID19 permitting).

The full Work Plan of activities is shown in Appendix 5.

Preliminary Areas of Focus and Questions

The road-map stages of this assignment will seek to address the following topics:

1. What are the predominant Climate Change issues facing the Fisheries Sectors and Domains in Jamaica? What are the likely scenarios which will unfold in the next 5-10 years?

2. What are the details of the other WB funded projects referenced in the reports and what outcomes are they likely to result in (e.g. Rehabilitated/Upgraded Aquaculture Hatchery; Mariculture Demonstration Facilities; Climate Resilient Demo Fish Farm; Alternatives to Commercial Fish Feed) which could be potentially linked to?

3. What are the sustainable livelihood models currently operating for fisherfolk in the related sectors in Jamaica? What makes them successful? Conversely which target beneficiary livelihoods are most threatened? How can such livelihoods be improved upon?

4. What have the Marine Protected Areas and Fish Sanctuaries achieved in the last 3-4 years? What accounts for their successes and what are the outstanding challenges they face? What economic and business models pertain in such entities?

5. What are the mutual vested interests and common ground of the diverse stakeholders (e.g. communities, public & private sectors etc.) operating in the shared areas of the Blue Economy which can form the basis for the sub-projects themes? Where are the new livelihoods in this Blue Economy Model?

6. What are the likely challenges for Beneficiaries, Communities and Associations to effecting transitioning from their current AS IS to the new TO BE in each sub-project?

7. What would a Community-based Aquaculture Sector look like in Jamaica – the supply and value chains needed to ensure a viable business model and self-sustaining commercial ecosystem? What are the learnings from other such operations globally?

8. What is the best use of the limited sub-project funds – to support the bigger projects in the same WB funded initiative; to act as seed capital for innovative actions to supplement these other bigger projects; to allow proof-of-concept for Blue Economy alternative livelihood transitioning actions….

2.6 Set-up & Way of Working

The consultant, Vernon Barrett, is based in London and will be conducting work remotely and in country over the 6-month elapsed period September 2020 to March 2021.

Whist in country it is expected that the consultant will have access to, and use of, an office space on the client's premises with wi-fi connectivity which complies with any Government COVID19 regulations in force at the time. The consultant will bring and use his own laptop and mobile communications for the duration of the assignment. He will be using dedicated transport, such as a car rental, as required due to COVID19 restrictions of travel.

Face-to-face meetings with individual stakeholders will be kept to a minimum and comply with COVID19 regulations. Group sessions such as Focus Groups, workshops will be discussed, and planned, with the client well in advance of dates set. Flexibility will be the key watchword in project's execution & approach.

TABLE 3: List of Project Team Members (final composition tbc)

Name	Speciality	Tel	E-mail
Mrs. Avery Smikle*	Fisheries Division, Director Aquaculture Branch, TT	876-433-0657	adsmikle@micaf.gov.jm
Ms. Selena Ledgister	Project Manager	876-488-1316	smledgister@micaf.gov.jm
Mr. Dehaan Brown *	Research Officer, Aquaculture Branch	876-429-8033	ddbrown@micaf.gov.jm
Ms. Shellene Berry	Fisheries Officer (Social Science)	***TBA***	ssberry@micaf.gov.jm
Ms Mellisha C Meeks	Project Administrator	876-831-7007	mcmeeks@micaf.gov.jm
TBA	***NFA Fisheries Officer***	***TBA***	***TBA***
TBA	***NFA Mariculture Officer***	***TBA***	***TBA***
Mr Andrew Darnells	Procurement Specialist, NFA	876-948-9014	aadarnells@micaf.gov.jm

3. Timeline & Deliverables

The table below shows the Key Project Deliverables for this Assignment and their respective deadline dates to ensure a preferred closing out date for the assignment of 6 March 2021. This date, as per contract, is subject to review due the prevailing backdrop of the global COVID19 Pandemic.

DELIVERABLE	DUE DATE
An Inception Report which includes a detailed workplan and proposed methodology in carrying out the tasks under this assignment	Within 2 weeks of the commencement of the assignment, which was on 7 September 2020. **(21 September 2020)**
Report summarizing the Literature Review, Community Mobilization Workshops and consultations with key stakeholders identifying sub-projects.	Within 2 months of commencement **(6 November 2020)**
Draft report with Project Concept Notes validated by the stakeholders.	Within 4 months of commencement **(6 January 2021)**
Final reports, Project Concept Notes in electronic and hard copy.	Within 6 months of commencement **(6 March 2021)**

4. Preliminary Reflections

The first couple of weeks, during which this Inception Report was drafted, has provided an opportunity for those involved to understand in greater detail the existing circumstances "on the ground" and identify any issues which may have developed since this sub-project assignment was initially conceived and shaped.

This current project is building on the previous work, findings, and recommendations of the World Bank Study (Project reference: SCF-PPRC-TF0-AO726 – Pilot Programme for Climate Resilience - PPCR) conducted during the period January to March 2017 by the external consultant, Mr. Gianluigi Negroni.

The previous assignment completed in early 2017 served as a Project Preparation Phase - featuring extensive consultations with stakeholders – and is to serve as a reference and guide for the development of Concept Notes for this new assignment.

It has been 3 years since the Project Preparation Phase was completed and therefore changes will have happened which need to be ascertained and incorporated into this current project assignment. For example, it is known that the Associations and group entities are fragile and may have undergone significant changes and indeed may no longer be viably functioning. It will be important to focus resources and effort on those Associations which have shown propensity to be successfully capacity built in recent years in the shaping of Sub-Project Concept Notes and Sub-Projects.

5. Risks & Assumptions

The project is taking during a period of unprecedented uncertainty in the context of the global COVID19 Pandemic. Many activities may have to be performed virtually (remotely) and without large groups congregating in enclosed spaces and the project plan will be shaped with anticipated restrictions in mind.

The consultant, Vernon Barrett, will deliver many activities over the Internet with the use of Zoom, Skype, and other digital communication tools whilst based abroad. He will endeavour to make a couple of visits in person to Jamaica to conduct those activities that require his physical presence. The current timings of these visits are shown in the Detailed Work Plan in Appendix 5. These trips are subject to revision as the Pandemic and its impacts unfold.

The contract specifies an original project target end date of December 20, 2020 but also made allowance for extensions, as agreed by both parties, into the next year 2021 – arising from COVID19 etc. At this point, it is not expected that the possible project extension date would run beyond the end of March 2021. ***However, the risk is currently there of unforeseen changes arising due to further COVID19 developments, globally and flexibility will be required in project timelines and method and execution.***

Another significant area of potential uncertainty will arise if it is determined that ***the proposed sub-projects need to be linked to other World Bank initiatives being funded under the same Grant Budget; in that event there will be significant execution risks associated with the inherent project dependencies and so it is recommended that such linkages should be minimised or avoided.***

APPENDIX 1 – Preliminary List of Proposed Interviewees

ID. NO.	ORGANISATION NAME	CONTACT PERSON	TITLE	CONTACT PHONE
Associations, Cooperatives and Fish Sanctuaries				
1	BREDS-Galleon Sanctuary	Luke-Ben Brown	Sanctuary Manager	876-567-1646
	BREDS-Galleon Sanctuary	Jason Henzell	Chairman, BREDS	876-562-0000
2	Alligator Head Foundation	Nickie Myers	Sanctuary Manager	876-329-3140
3	Oracabessa Bay Fish Sanctuary	Inilek Wilmott	Sanctuary Manager	876-527-0538 / 876-416-5371
4	Gillings Gully Fishermen Co-operative	Denise Blackwood	Manager	876-963-5063
5	Green Island Fishermen Group	Mr Bowen	President	876-527-3966
6	Jamaica Fisherman's Co-operative Union	Ms Ionie Henry	General Manager	
7	Jamaica Freshwater Fish Farmers' Association	Dr Vincent Wright	President	
8	Jamaica Ornamental Fish Farmers' Association	Mr Norman Dawson	President	
Social Development Agencies				
9	Planning Institute of Jamaica	Mrs Nadine Brown	Director - Sustainable Development	
10	JSIF	Omar Sweeny	MD	
Government Ministries & Agencies				
11	Minister of Agriculture & Fisheries	Mr Floyd Green	Minister	
12	Minister of Tourism	Mr Edmund Bartlett	Minister	
13	Dept. Of Cooperatives & Friendly Societies	Paulette Kirkland	Director of Policy, Research, Training and Development	876-816-1182
14	Tourism Product Development Company	Mrs A Chung	Director	876-579-9493
15	HEART-NTA	Jennifer Walker	Senior Director	876-354-7154
16	Port Authority of Jamaica	Mark Hylton	Manager	876-364-3611
17	NEPA	Mr Peter Knight	CEO	TBA
Financial Institutions				
18	Jamaica Business Fund	Lushana Francis	TBA	
19	REDI (II)	Kameisha Batcham	Project Manager	
20	Tourism Enhancement Fund	Dr Carey Wallace	Executive Director	
Private Sector				
21	PSOJ	Mr Keith Duncan	President	
22	Sandals Foundation	Mr Adam Stewart	President	
23	Branson Centre for Entrepreneurship (Caribbean)	Ms Lauri-Ann Ainsworth	CEO	
Global Institutions				
24	World Bank	Ms Maja Murisic	Team Task Leader (Washington)	
25	FOA	Dr Crispim Moreira	Country Representative	
26	European Union	Stefano Cilli (or successor)	EU Officer responsible for Fisheries/Environment	
Ongoing Marine Climate Change Projects				
27	SODECO (UWI-Mona)	Prof. Terrence Forrester	Managing Director	
28	BE-CLME+ Project	CRFM/GEF/CERMES (UWI)	TBA - identify POC in Jamaica	
29	The Nature Conservancy	Donna Blake	Director	876-754-4579

APPENDIX 2 - Outline of Concept Note (Recommended)

A STANDARD EUROPEAN UNION FUNDING APPLICATION TEMPLATE

1. SUMMARY OF THE ACTION (1 page)

A. Title of the action:

- Location(s) of the action:
- Total duration of the action (months):
- EU financing requested (amount):
- EU financing requested as a percentage of total budget of the Action (% indicative)

B. Objectives of the action

- Overall objective(s)
- Specific objective(s)

C. Target group(s) & Final beneficiaries

D. Estimated results

E. Main activities

2. DESCRIPTION OF THE ACTION (1 Page)

a) Give the background to the preparation of the action.

b) Explain the objectives of the action

c) Describe the key stakeholder groups, their attitudes towards the action and any consultations held with them.

d) Briefly state the type of activities proposed and specify related outputs and results, including a description of linkages/relationships between activity clusters.

e) State the broad timeframe for the action and describe any specific factor that has been taken into account.

3 RELEVANCE OF THE ACTION (Max 3 Pages)

3.1.1. Relevance to the objectives/sectors/themes/specific priorities of the call for proposals.

a) Describe the relevance of the action to the objective(s) and priority (ies) of the call for proposals.

b) Describe the relevance of the action to any specific subthemes/sectors/areas and any other specific requirements stated in the Guidelines for the call, e.g. local ownership etc.

c) Describe which particular expected results referred to in the Guidelines for the call will be addressed.

3.1.2. Relevance to the particular needs and constraints of the target country/countries, region(s) and/or relevant sectors (including synergy with other EU initiatives and avoidance of duplication)

a) State clearly the specific pre-project situation in the target country/countries, region(s) and/or sectors (include quantified data analysis where possible).

b) Provide a detailed analysis of the problems to be addressed by the action & how they are interrelated at all levels.

c) Refer to any significant plans undertaken at national, regional and/or local level relevant to the action and describe how the action will relate to such plans.

d) Where the action is the continuation of a previous action, clearly indicate how it is intended to build on the activities/results of this previous action; refer to the main conclusions and recommendations of any evaluations carried out.

e) Where the action is part of a larger programme, clearly explain how it fits or is coordinated with that programme or any other planned project. Specify the potential synergies with other initiatives

3.1.3. Describe and define the target groups and final beneficiaries, their needs and constraints, and state how the action will address these needs

a) Give a description of each of the target groups and final beneficiaries (quantified where possible), including selection criteria.

b) Identify the needs and constraints of each of the target groups and final beneficiaries.

c) Demonstrate the relevance of the proposal to the needs and constraints of the target groups and final beneficiaries.

d) Explain any participatory process ensuring participation by the target groups and final beneficiaries.

3.1.4. Particular added-value elements

Indicate any specific added-value elements or other cross-cutting issues

APPENDIX 3 – Recent Global Climate Resilient Aquaculture Projects

Project Code: TCP/SLC/3601
Project Title: Towards a Caribbean Blue Revolution (June 2019)
Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis

Project Code: TCP/MOZ/3604
Project Title: Development Support to Commercial Aquaculture in Inhambane Province - Mozambique (November 2019)

Project Code: TCP/RAS/3603
Project Title: Promoting Scaling up of Climate Resilient Tilapia Pond Farming in the Philippines (March 2019)

Project Code: TCP/RAS/3603
Project Title: Promoting Scaling up of Climate Resilient Tilapia Pond Culture Practices for Blue Growth in Bangladesh (January 2019)

1. **Decision-making and economics of adaptation to climate change in the fisheries and aquaculture sector.** FAO Fisheries and Aquaculture Technical Paper No. 650. (Rome, FAO. 2019)

2. **Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options.** FAO Fisheries and Aquaculture Technical Paper No. 627. (Rome, FAO. 2018).

3. **Promoting greater coherence between small-scale fisheries and social protection policies, mechanisms and programs in Cambodia** – Research Summary (Rome/Penang. FAO. 2019)

4. **FISH4ACP - Unlocking the potential of sustainable fisheries and aquaculture in Africa, the Caribbean and the Pacific**

5. **Towards gender-equitable small-scale fisheries governance and development**
   In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication - A Handbook

6. **Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication**

7. **Small-scale aquaponic food production. Integrated fish and plant farming.**
   FAO Fisheries and Aquaculture Technical Paper No.589. (Rome, FAO. 2014)

8. **Aquafeed value chain analysis and a review of regulatory framework of striped catfish farming in Viet Nam.** (Rome, FAO. 2019)

9. **FAO REGIONAL CONFERENCE FOR ASIA AND THE PACIFIC**
   Thirty-fifth Session - Thimphu, Bhutan, 17-20 February 2020
   Building resilience of small-scale fisheries to ensure food security and nutrition in the Pacific

10. **FAO TECHNICAL WORKSHOP ON ADVANCING AQUAPONICS THROUGH STRENGTHENED VALUE CHAINS -** Christ Church, Barbados, 11–14 December 2018

11. **MULTISTAKEHOLDER WORKSHOP ON ADVANCING AQUAPONICS**
   Bogor, Indonesia, October 2016 (Rome FAO 2017)

12. **EAF Toolbox: The ecosystem approach to fisheries.** (Rome. FAO. 2012)

13. **Contract farming and public–private partnerships in aquaculture**
   Lessons learned from East African countries (Rome FAO 2018)

14. **Report of Capacity Development Workshop on the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication for Indigenous Peoples of Central America**. Panama City. (FAO 2019)

15. **Leaving No-one Behind: How Blue Growth can benefit women, youth, indigenous groups and migrants** (FAO 2018)

16. **Achieving Blue Growth - Building vibrant fisheries and aquaculture communities** (FAO 2018)

17. **THE FAO BLUE GROWTH INITIATIVE: STRATEGY FOR THE DEVELOPMENT OF FISHERIES AND AQUACULTURE IN EASTERN AFRICA** (Rome. FAO. 2018)

18. **Blue Growth Initiative - Partnering with countries to achieve the Sustainable Development Goals**

APPENDIX 4 - Abbreviations and Acronyms

AD	Aquaculture Department
ACP	African Caribbean Pacific
CS	Case study
CU	Central Unit
EU	European Union
EEZ	Exclusive Economic Zone
FAD	Fishery Aggregation Device
FAO	Food and Agriculture Organization
GDP	Gross Development Product
FD	Fishery Division
GOJ	Government of Jamaica
IDRC	International Development and Research Centre
LICJ	Land Information Council of Jamaica
GIS	Geographical Information System
MPA	Marine Protected Areas
NEPA	National Environmental and Planning Agency
NSDU	National Spatial Data Unit
PPCR	Pilot Program for Climate Resilience
RPAA	Rapid Participatory Aquaculture Appraisal
RPPU	Rural Physical Planning Unit
PPP	Private Public Partnership
PPT	Power Point
RFU	Regional Facilitation Unit
RPPU	Rural Physical Planning Unit
SCF	Strategic Climate Fund
SPCR	Strategic Programme for Climate Resilience
SPLCR	Livelihood Diversification and Value Chain Specialist
ToR	Term of Reference
TCP	Technical Country Project
TT	Technical Team
USAID	United States Aid
UWI	University of West Indies
WG	Working Group

APPENDIX 5 - Detailed Work Plan

IDENTIFY SUB-PROJECTS ON CLIMATE RESILIENT FRESHWATER AQUACULTURE, COASTAL MARICULTURE & OTHER ALTERNATIVE LIVELIHOODS

PHASES 1 & 2

				Month	SEPTEMBER (2020)				OCTOBER				NOVEMBER	
				w/c	7	14	21	28	5	12	19	26	2	9
				Week No.	1	2	3	4	5	6	7	8	9	10
ID	ACTIVITY	TASK	WHO					Consultant in Jamaica						
			Consultant	Client										
1	Inception / Discovery Phase	Mobilisation - Agree the Approach & this Work Plan with the Client (NFA Directorates & SL)												
		Agree objectives, definition of terms, focus of assignment and priorities	VB	SL										
		Identify which info to gather & provisional sources such as preparation phase outputs; Prioritise	VB	SL										
		Identify the Stakeholders, Key decision makers & Champions for Implementation	VB	SL										
		- Supply a list of said people with their contact details		SL										
		Introduce VB to these potential interviewees		SL										
		- Call and schedule the interviews (interviews to be via Zoom or over phone)	VB											
		Conduct Internet research on Fisheries Sector (Jamaica and other similar countries)	VB											
		Develop the Detailed Work Plan for the Assignment (this document)	VB											
	Deliverable 1	*Deliver Inception Report - Draft (Working Document)*	VB				21-Sep-20							
		SIGN OFF INCEPTION REPORT		SL				28-Sep-20						
2	Mapping the AS IS (Current)													
		Situational Analysis of Aquaculture & Mariculture Sectors (current)												
		Literature Review of existing Aquaculture / Mariculture / Polyculture options	VB											
		Access information summarised from previous consultations with stakeholders		SL										
		Review all reports derived from the earlier Project Preparation Phase	VB											
		Collate successful projects & interventions globally from FAO and others (EU, IDB etc) in similar SIDS	VB											
		Plan, Arrange & deliver mobilisation workshops with	VB	SL										
		- Community Groups												
		- Fish Farmers												
		- Key Value-chain Actors												
		Plan & hold consultations with:	VB	SL										
		- Social Development Entities												
		- Financial Entities												
		- MICAF												
		- NFA												
		- Others (TBA)												
	Deliverable 2	*Summary Situational Report of Literature Review, Workshops and Consultations*	VB										02-Nov-20	
		SIGN OFF SUMMARY SITUATIONAL REPORT		SL										09-Nov-20

IDENTIFY SUB-PROJECTS ON CLIMATE RESILIENT FRESHWATER AQUACULTURE, COASTAL MARICULTURE & OTHER ALTERNATIVE LIVELIHOODS

PHASES 3 & 4

				Month	NOVEMBER			DECEMBER				JANUARY (2021)				FEBRUARY				MARCH	
				w/c	*16*	*23*	*30*	*7*	*14*	*21*	*28*	*4*	*11*	*18*	*25*	*1*	*8*	*15*	*22*	*1*	*8*
				Week No.	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
ID	**ACTIVITY**	**TASK**	**WHO**				Consultant in Jamaica				Christmas Vacation	New Years									
			Consultant	*Client*																	
3	**Visioning TO BE (Future)**																				
		Identification of Potential Sub-Projects																			
		Synthesize the information derived from the Situational Analysis above	VB																		
		- Generate long list of potential sub-projects																			
		- Conduct a High Level Risk Assessment / Value Proposition Analysis for each																			
		- Prioritise the Sub-Project concepts into a shortlist																			
		- Summarise the Potential Sub-Projects in a matrix format with recommendations																			
		Design of the Initial Concept Notes for Sub-Projects (Outline)																			
		Prepare the template for drawing up the Initial Concept Notes - use the standard EU format for Concept Note	VB																		
		Draft Project Concept Outlines for the shortlisted sub-projects (3-4)	VB																		
		Circulate Sub-Projects to Stakeholders / Hold Group Session with Stakeholders	VB	SL																	
		Validate & confirm Sub-Projects with Stakeholders	VB	SL																	
	Deliverable 3	***Deliver Draft report with Project Concepts (validated by Stakeholders)***	**VB**									08-Jan-21									
		SIGN DRAFT REPORT WITH CONCEPT NOTES		**SL**									15-Jan-21								
4	**Articulating the Vision (Details)**																				
		Detailing of Initial Concept Notes for Sub-Projects (for Steering Committee)																			
		For each validated sub-project concepts flesh out the details:	VB																		
		- Project Objective																			
		- Proposed Acitvities & Implementation Arrangements																			
		- Budget & Timeline																			
		- Environmental & Social Risks																			
		- Feasibility Overview																			
		Sign-off Concept Notes for shortlisted sub-projects (Steering Committee)	VB	SL																	
	Deliverable 4	***Deliver Final Reports and Project Concept Notes (electronic & hard copy)***	**VB**																		08-Mar-21
		SIGN OFF FINAL DOCUMENTS		**SL**																	12-Mar-21